

Chapter 4



Ken Sturm/USFWS

Hermit Thrush

Management Direction and Implementation

- Introduction
- Development of Refuge Goals, Objectives, and Strategies
- General Refuge Management
- Refuge Goals, Objectives and Strategies

Introduction

This CCP includes an array of management actions that, in our professional judgment, work toward achieving the refuge purposes, the vision and goals for the refuge, and State and regional conservations plans. In our opinion, it will effectively address the key issues. We believe it is reasonable, feasible, and practicable.

In all program areas, this CCP will enhance the quality and sustainability of current resource programs, develop long-range and strategic step-down plans, and promote partnerships.

Development of Refuge Goals, Objectives, and Strategies

We presented the refuge goals in chapter 1. Developing refuge goals was one of the first steps in our planning process. Goals are intentionally broad, descriptive statements of the desired future condition for refuge resources. By design, they are less quantitative, and more prescriptive, in defining the targets of our management. They also articulate the principal elements of refuge purposes and our vision statement and provide a foundation for developing specific management objectives and strategies.

Objectives are essentially incremental steps toward achieving a goal; they also further define the management targets in measurable terms. Objectives provide the basis for determining more detailed strategies, monitoring refuge accomplishments, and evaluating our success. U.S. Fish and Wildlife Service (Service) guidance in “Writing Refuge Management Goals and Objectives: A Handbook” (USFWS 2004a) recommends that objectives possess five properties to be “SMART”: (1) specific; (2) measurable; (3) achievable; (4) results-oriented; and (5) time-fixed.

A rationale accompanies each objective to explain its context and why we think it is important. We will use the objectives to write refuge step-down plans. We will measure our successes by how well we achieve those objectives.

We next identified strategies for each of the objectives. These are specific actions, tools, techniques, or a combination of those that we may use to achieve the objective. The list of strategies under each objective represent the potential suite of actions to be implemented, and by design, most will be further evaluated as to how, when, and where they should be implemented in refuge step-down plans.

We developed a habitat management map, a public use map, and a hunt map to accompany the text. Using Geographic Information Systems (GIS) mapping tools and data sets, the habitat maps are intended to help readers visualize where the refuge will conduct habitat management strategies on the ground. The habitat management maps are not meant to identify exact locations for implementing a particular strategy on the ground. Explanation of habitat management strategies are detailed further in the objectives section under each goal. It will be up to our refuge staff to decide during the implementation phase what specific strategy applies to a particular site, at what level or timing it should apply, and exactly where it applies on a given site. These actions will be detailed in the annual Habitat Management Plan (see “Refuge Step-Down Plans” below) and annual work plans.

The public use maps are intended to show the reader where the refuge will add new infrastructure for visitor use, such as new trails and new observation platforms. In some cases, the Service will need to conduct additional NEPA analysis before deciding where to build new trails and other infrastructure. Engineers and other professionals will assist with this analysis. The hunt maps illustrate which areas of the refuge will be open to hunting.

General Refuge Management

We primarily developed our management direction hierarchically, from goals to objectives to strategies. However, we also found that many actions we wanted to highlight either relate to multiple goals or represent general administrative or compliance activities. We present those below.

Developing Refuge Step-down Plans

Service planning policy identifies 25 step-down plans that may be applicable on any given refuge. We have identified the six plans below as the most relevant to this planning process, and we have prioritized them. Sections of the refuge Habitat Management Plan (HMP) which require public review are presented within this document and will be incorporated into the final version of the HMP. We will also develop an annual HMP and Habitat and Species Inventory and Monitoring Plan as the highest priority step-down plans. These are described in more detail below. They will be modified and updated as new information is obtained so we can continue to keep them relevant. Completion of these plans supports all five refuge goals.

The following step-down management plans are to be completed as follows:

- A Habitat Management Plan (HMP), immediately following CCP approval (see discussion immediately below).
- An Annual Habitat Management Plan (AHMP), within 1 year of CCP approval (see discussion below).
- A Habitat and Species Inventory and Monitoring Plan (HSIMP), within 2 years of CCP approval (see discussion below).
- Fishing Plan within 2 years of CCP approval.
- A Visitor Services Plan, within 3 years of CCP approval.
- A Law Enforcement Plan, within 3 years of CCP approval.
- Facilities and Sign Plan, within 3 years of CCP approval.

Habitat Management Plan (HMP)

A HMP for the refuge is the requisite first step to achieving the objectives of goals 1–3. The HMP will incorporate habitat objectives developed herein, and will also identify “what, where, how, and when” actions and strategies will be implemented over the 15 year time frame to achieve those objectives. Specifically, the HMP will define management areas, define treatment units, identify type or method of treatment, establish the timing for management actions, and define how we will measure success over the next 15 years. In this CCP, the goals, objectives, and list of strategies under each objective identify how we intend to manage habitats on the refuge. Both the CCP and HMP are based on current resource information, published research, and our own field experiences. Our methods, timing, and techniques will be updated as new, credible information becomes available. To facilitate our management, we will regularly maintain our GIS database, documenting any major vegetation changes on at least a 5-year basis.

Annual Habitat Management Plan and Habitat and Species Inventory and Monitoring Plan (AHMP, HSIMP)

The AHMP and HSIMP for the refuge are also priorities for completion soon after CCP approval. Like the HMP, these plans are also vital for implementing habitat management actions and measuring our success in meeting the objectives. The AHMP is generated each year from the HMP, and will outline specific management activities to occur in that year. The HSIMP will outline the methodology to assess whether our original assumptions and management actions are, in fact, supporting our habitat and species objectives. Inventory and monitoring needs will be prioritized in the HSIMP. The results of inventories

and monitoring will provide us with more information on the status of our natural resources and allow us to make more informed management decisions.

Refuge Staffing and Administration

It is important to recognize that additional staffing and funding will be necessary to implement the CCP. In appendixes F and G we identify the level of funding and staffing needs based on this management action. However, our budgets are determined annually by Congress and distributed through our Washington and Regional offices before arriving at field stations. Therefore, the refuge does not have total control over its annual allocation of resources. Below we describe activities related to staffing, administration, and operations. Implementing these activities supports all our refuge goals.

Operational Budgets and Permanent Staffing

One of our objectives is to sustain annual funding and staffing levels that allow us to achieve our refuge purposes, as interpreted by the goals, objectives, and strategies. Many of our most visible projects since refuge establishment were achieved through special project funds that typically have a 1- to 2-year duration. While these funds are very important to us, they are limited in their flexibility since they typically can not be used for any other priority project that may arise. As previously mentioned, funding for land acquisition is derived primarily from two sources—the Land and Water Conservation Fund and the Migratory Bird Conservation Fund. Funds from these sources are generally directed at specific acquisitions.

A Regional Plan was developed in FY 2007 to implement a new approach to budgeting. The goal of base budgeting was to have a maximum of 75 percent of a refuge station's budget cover salaries and fixed costs, while the remaining 25 percent or more will be operations dollars. The intent of this strategy was to improve the refuge manager's capability to do the highest priority project work and not have the vast majority of a refuge's budget tied up in inflexible, fixed costs.

Appropriateness and Compatibility Determinations

Chapter 1 describes the requirements for appropriateness and compatibility determinations. Appendix B consists of approved appropriateness and compatibility determinations to support the activities in the CCP. We will only allow activities determined compatible that meet or facilitate refuge purposes, goals, and objectives (603 FW 2) (2000).

When the Service acquires land within the current acquisition boundary in full, fee-simple ownership, we will consider public access and compatible public recreation, and other refuge uses, consistent with what we currently allow on the existing refuge lands. Each acquisition is reviewed for compatible priority public uses which may get incorporated into the management of that parcel. When a conservation easement, or a partial interest, is purchased, the Service's objective is to obtain all rights determined necessary to ensure protection of Federal trust resources on that parcel. Typically, at a minimum, the purchase will include development rights. However, we may also seek to obtain the rights to manage habitats, and/or to manage public use and access, if the seller is willing and we have funding available.

Wildlife-Dependent Recreational Program

With the assistance of the Service's Regional Visitors Services Review Team, two public use program emphases have been determined for this refuge: wildlife observation and hunting. This determination was based on careful consideration of our natural resources, existing staff, operational funds, existing and potential facilities, and which programs we will be most effective in providing "quality" opportunities for visitors. The community survey we conducted with assistance from the U.S. Geological Survey (USGS) in 2007 (Sexton, N.R., et. al., 2009) indicates that self-guided interpretation and wildlife observation, and hunting



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Birdwatching

are highly desired in the area. While all of the priority public uses are important, wildlife observation and hunting will receive greater emphasis. As always, we look to our partners, friends, and/or other volunteers to help develop and assist with the refuge's public use programs.

Refuge Operating Hours

The refuge is open from one hour before sunrise to one hour after sunset, seven days a week, to ensure visitor safety and protect refuge resources. However, the refuge manager has the authority to issue a special use permit to allow others access outside these timeframes. For example, research personnel may be permitted access at different times if necessary for successful completion of a research project.

Commercial and Economic Uses

All commercial and economic uses will adhere to 50 Code of Federal Regulations (CFR), Subpart A, §29.1 and Service policy which allow these activities if they contribute to the National Wildlife Refuge System (Refuge System) mission, or refuge purposes and goals. Allowing these activities also requires the Service to determine appropriateness and prepare a compatibility determination and an annual special use permit outlining terms, conditions, fees, and any other stipulations to ensure compatibility.

Reserved Rights

While purchasing land to complete the refuge boundary the Service has acquired land with reserved rights, rights-of-way, leases and other agreements. Currently there are over 37 reserved rights listed in realty files for land owned by the refuge. Most include rights for mineral extraction (oil and gas predominately) and rights to run power and gas lines across refuge lands to serve commercial and residential interests. The refuge will follow policy guidance when any of these reserved rights are exercised. Specifically we follow 50 CFR 29.21-9, ensure compliance under the refuge compatibility policy (603 FW 2) and biological integrity, diversity and environmental health policy (601 FW 3). Depending on the location and the extent of disturbance required to exercise reserved rights on refuge lands, other laws may apply. In general, the refuge will coordinate with all private parties exercising their rights to ensure the protection of refuge resources. The refuge will issue special use permits as necessary to manage these uses and to ensure that impacts to refuge resources are as low as possible.

Distributing Refuge Revenue Sharing Payments

As we describe in chapter 3, we pay annual refuge revenue sharing payments to counties based on the acreage and the appraised value of refuge lands in their jurisdiction. These annual payments are calculated by a formula determined by Congress, which also appropriates funding. We will continue those payments in accordance with the law, commensurate with changes in the appraised market value of refuge lands, or new appropriation levels dictated by Congress.

Community Relations

Knowing that public lands cannot survive without a constituency that supports them, the refuge will continue to build relationships that effect sound stewardship through partnerships developed in the communities we serve. We will continue to work within community forums such as the Tucker County Chamber of Commerce and town meetings, Rotary and other venues. Refuge staff will maintain an ongoing dialogue with our congressional delegation, the State of West Virginia, the Tucker County Commission, local elected officials, the business community and refuge neighbors. We will foster a spirit of cooperation with all of our stakeholders and be transparent in our management of lands entrusted to us by the American people.

Cultural Resources

As a Federal land management agency, we are entrusted with protecting historic structures and archaeological sites on our land which are eligible for, or listed on, the National Register of Historic Places. Service cultural resource managers in the regional office keep an inventory of known sites and structures and ensure that we consider them in planning new ground disturbing or structure altering changes to the refuge. They consult with the West Virginia Division of Culture and History (West Virginia's State Historic Preservation Office [SHPO]) concerning projects which might affect sites and structures, and conduct or contract archaeological or architectural surveys when needed. Projects can usually be redesigned to avoid affecting National Register eligible sites or structures or the Service would plan mitigation for the effects in consultation with the SHPO. The Service's existing practices with reference to National Historic Preservation Act compliance will continue. An architectural historian will inventory and evaluate historic structures on the refuge. When changes on the refuge involve structures over 50 years old, the Service will comply with Section 106 of the National Historic Preservation Act on a case by case basis.

Land Acquisition

Currently, the refuge comprises 28 tracts and protects 16,193 acres of wildlife habitat and wetland communities. We will continue to pursue acquisition from willing sellers of the 8,932 acres of land that remains privately owned in the refuge's approved acquisition boundary, potentially expanding the refuge's total acreage to approximately 25,000 acres. The remaining lands to be acquired include wetlands, riparian areas, grasslands, and upland forested habitats that provide important resting, nesting, and feeding locations for a host of migratory birds (waterfowl, wading birds, shorebirds, raptors, and songbirds) and threatened and endangered species. They also contain wetlands and rare plant communities. Upland communities also provide critical connections to protect and maintain the integrity of wetland habitat, one of the primary objectives in the establishment of the refuge.

Our preference will be to acquire new lands in fee simple since that method ensures full management control and flexibility. However, the method of acquisition will also take into consideration the needs and desires of the present landowner. As we acquire these lands, we will manage them according to the goals, objectives, and strategies of the CCP.

As land is evaluated for acquisition by the Service, the habitat types, habitat connectivity, related wildlife populations and plant community values are taken into consideration. Once acquired, management activities planned for new

property are considered relative to the amount of particular habitat types the property contains as well as the spatial relationship between habitat types on the property relative to habitat types on adjacent refuge land and other protected lands. These relationships help determine the types of potential management activities which the Service may apply to the new land acquisition. For example, new land acquisitions which contain pasture or other grassland habitat may be considered for continued grassland management for grassland obligate bird species if there are at least 50 acres of grassland within the newly acquired property or it is contiguous with existing refuge lands currently under grassland management. Lands which contain wetland habitat will be protected and management may include improving the buffering capacity of adjacent uplands by increasing riparian corridors if necessary and conducting restoration actions to prevent erosion or habitat fragmentation. Land which contains edge hardwood forested communities and aspen stands will be considered for successional forest management to provide young dense vegetation for priority early successional bird species. Conversely, forested habitat which is contiguous with stands of forest on existing refuge lands will be protected and restoration applied to improve forest interior breeding bird habitat or maintain movement corridors between the refuge and other protected lands in the watershed.

Any management activities considered will relate directly to priority migratory birds, threatened and endangered species protection and to the other purposes for which the refuge was established.

Youth Conservation Corps

We will maintain the annual Youth Conservation Corps (YCC) program which has generally consisted of a crew of four to five persons (15-18 years old), and a crew leader. This has been a popular program in the local community because local youth employment opportunities are limited. The crew accomplishes many important tasks in support of our visitor services programs, biological programs, and maintenance needs.

National Natural Landmark

The Canaan Valley was designated a National Natural Landmark (NNL) in 1974, a program managed by the National Park Service (Park Service). The NNL is currently 24,763 acres of which 16,054 are within the refuge. The purpose for the designation was to protect the relict boreal ecosystem, the high diversity of habitats, large areas of wetlands and opportunities for outdoor education and recreation in the valley. The Service will uphold the founding purposes for the establishment of the NNL and the refuge will work with the Park Service to further the purposes of the NNL in keeping with the purposes of the refuge and the mission of the Service.

Invasive Species

The Refuge System has identified management to control the establishment and spread of invasive plants as a national priority. Fortunately, on this refuge, the threat is currently low. However, our objective is to ensure no new invasive plant species become well established, and we will manage to control the spread of what does exist. To the extent possible, we will physically remove invasive species where they are encountered. We will use approved herbicides when determined by the refuge manager to be necessary to control invasive plants, after regional office review and approval. Of particular concern on the refuge are existing stands of multiflora rose, yellow iris, Japanese stilt grass, and garlic mustard. Other species such as purple loosestrife and Japanese knotweed are found nearby but have not yet been documented on refuge property.

In conjunction with the HMP and HSIMP, we will develop a list of species of greatest concern on the refuge, identify priority areas with which to be vigilant, and establish monitoring and treatment strategies. Refer to the National Wildlife Refuge System Invasive Species Management Strategy released in May 2003 (USFWS 2003) for additional tools, processes, and strategies. The 2003 report is complimented by a technical report issued in May 2004 by USGS and others,

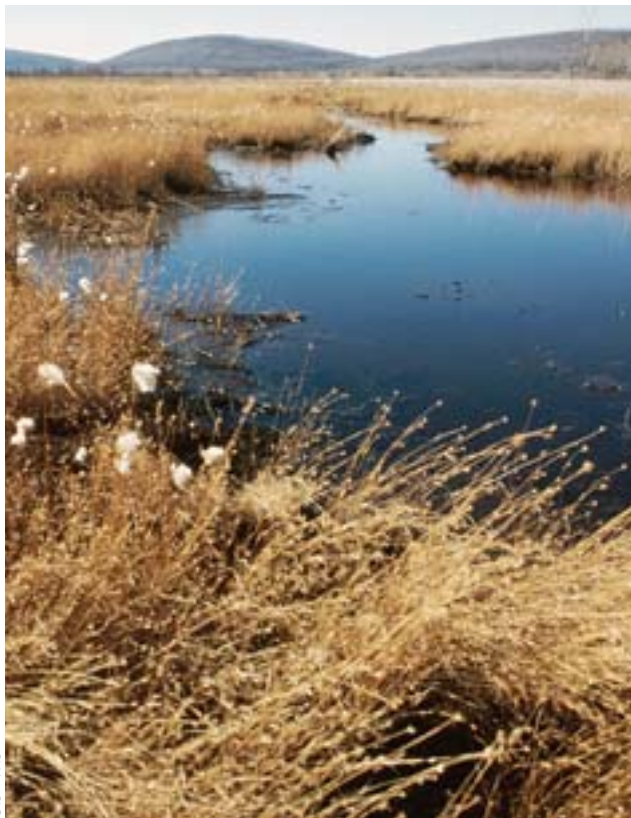
titled: The Invasive Species Survey: A Report on the Invasion of the National Wildlife Refuge System (Simonson et al. 2004). These reports together give both a status review and a management strategy for combating invasive species. In addition, we will stay abreast of Service policy revisions currently being reworked to facilitate implementation. Other strategies will include:

- Institute proper care of all refuge equipment to avoid introduction or transport of invasive plants;
- Require researchers on the refuge to take steps to prevent transportation of terrestrial invasives, aquatic invasives and pathogens;
- Work with State and Federal agencies to prevent introduction of invasive species;
- Implement outreach and education programs, including signage, where appropriate, and actively support State initiatives on this topic; and,
- Develop special regulations on the refuge as warranted to control the spread of invasive species.

Implementing this program supports refuge goals 1-3 relating to the conservation of all wetland and upland habitats

Monitoring and Abatement of Wildlife and Plant Diseases

The Service Manual chapter on Disease Prevention and Control is not yet published. Until it is, we derive guidance on this topic from the Refuge Manual and specific directives from the Service Director. We will abide by the Refuge Manual and any specific directives when monitoring and abating wildlife and plant diseases.



USFWS

Canaan wetland

The Refuge Manual (7 RM 17.3) lists three objectives for disease prevention and control:

- 1) To manage wildlife populations and habitats so the likelihood of disease contraction and contagion are minimized;
- 2) To provide for early detection and identification of disease mortality when it occurs; and
- 3) To minimize losses of wildlife from disease outbreaks.

These objectives were published in 1982. Since that time, in addition to diseases that cause serious mortality among wildlife, more attention has been given to those diseases that are transmitted through wildlife to humans.

One serious wildlife disease receiving considerable attention worldwide is avian influenza. Of particular concern is the highly pathogenic Eurasian form (H5N1). In 2006, all refuges were instructed to prepare an Avian Influenza Surveillance and Contingency Plan. The plan for Canaan Valley refuge was approved in December 2006 and discusses methods for dealing with this disease.

In West Virginia, chronic wasting disease (CWD) is also of concern. This disease is a progressive brain

and nervous system disease found in deer and elk that ultimately causes death of infected animals. CWD was first documented in Hampshire County, West Virginia in 2005. The West Virginia Division of Natural Resources (WVDNR) has implemented control and monitoring actions since then which have resulted in the documentation of 45 deer testing positive for CWD in Hampshire County. Monitoring efforts have so far not confirmed CWD presence in deer anywhere else in the State. A CWD management plan for the refuge was approved in 2006.

Protecting Wetlands and Rare Plant Communities

The CCP recognizes the refuge's wetland complex as one of our most important management and conservation responsibilities. The wetlands in the valley represent the largest contiguous wetland complex in the State of West Virginia. These wetlands were also fundamentally important in the establishment of the refuge and are highlighted as important community types in both the West Virginia Conservation Action Plan (2006) and the U.S. Forest Service Final Land and Resources Management Plan (2006). The refuge protects at least 73 documented plant species of concern and much of the wetland area is comprised of unique and rare plant communities on a State and regional level. The Canaan Valley supports some of the State's largest and most stable populations of rare plant species, such as glade spurge and Jacob's ladder. More information about the rare plant species and communities the refuge supports and protects can be found in Chapter 3.

Research

Research will continue as a priority especially where related to wetlands, wildlife species of concern, and their habitats. Generally, we will approve permits for research projects that provide a direct benefit to the refuge or that will inform our decisions on managing natural resources for biological or public use programs on the refuge. The refuge manager also may consider requests that do not relate directly to refuge objectives, but instead relate to the protection or enhancement of native species and biological diversity in the region and support the goals of ecoregional conservation teams, such as the Atlantic Coast or Eastern Brook Trout joint ventures and the Central Appalachian Spruce Restoration Initiative (CASRI) working group.

All researchers are required to submit detailed research proposals following the guidelines established by Service policy and refuge staff. Special use permits will also identify the schedules for progress reports, the criteria for determining when a project should cease, and the requirements for publication or other interim and final reports. All publications will acknowledge the Service and the role of Service staff as key partners in funding and/or operations. We will ask our refuge biologists, other divisions of the Service, USGS, select universities or recognized experts, and the WVDNR to peer review and comment on research proposals and draft publications, and will share research results internally, with these reviewers, and other conservation agencies and organizations. To the extent practical, and given the publication type, all research deliverables will conform to Service graphic standards.

Some projects, such as depredation and banding studies, will require additional Service permits. The refuge manager will not approve those research projects until all required permits are received and the consultation requirements under the Endangered Species Act have been met.

Adaptive Management

We will employ adaptive management as a strategy to ensure we respond quickly to new information or events. The need for adaptive management is very compelling today because our present information on refuge species and habitats is incomplete, provisional, and subject to change as our knowledge base improves.

We will adapt our strategies to respond to new information and/or spatial and temporal changes or environmental events that may or may not have been predicted. We will continually evaluate management actions, both formally and informally, through monitoring or research, to consider whether our original

assumptions and predictions are still valid. In that way, management becomes a proactive process of learning what really works.

The refuge manager is responsible for changing management strategies if they do not produce the desired conditions. Significant changes may warrant additional NEPA analysis and public comment. Minor changes will not, but we will document them in project evaluation reports, or in our annual reports.

Generally, we can increase monitoring and research that support adaptive management without additional NEPA analysis, assuming the activities, if conducted by non-refuge personnel, are determined to be compatible by the refuge manager. Many of our objectives identify monitoring needs. Our HSIMP will determine what is planned in the foreseeable future. Implementing this strategy supports all five refuge goals.

NEPA requires site-specific analysis and disclosure of impacts in an environmental impact statement (EIS) for all major Federal actions. Other routine activities that have been found, individually and cumulatively, to have no significant effect on the environment, are categorically excluded from the NEPA requirements to prepare detailed environmental documents. Those generally include administrative actions.

Removing Surplus Structures and Site Restoration

The refuge will continue to address surplus structures currently located on Service-owned lands, and will develop a plan for removing structures on lands that are acquired in the future. Surplus structures include old hunting cabins, barns and hunting platform structures that are in disrepair and are not needed for Service use. These structures are not necessary and affect the aesthetic values of the refuge. Additionally most of these structures are not sound and therefore create a public safety issue. The refuge has worked with the West Virginia Department of Environmental Protection (WVDEP) Rehabilitation Environmental Action Plan (REAP) program to help remove most of these old, dilapidated structures.

The Service will also continue to address unnecessary access roads and skid trails located on Service-owned lands, and will develop a plan for removing these types of roads on lands that are acquired in the future. Following is a list of actions we will undertake to manage surplus structures and unnecessary access roads and skid trails:

- Within 3 years of acquiring property that includes a structure, determine if the structure is surplus to refuge needs and, if it is, remove the structure, assuming funding is available. The refuge will restore the site by re-grading it to natural topography and hydrology and revegetate it to establish desirable conditions.
- Within 5 years of CCP approval, inventory and assess all access roads, logging roads and skid trails within the refuge, and implement procedures to retire and begin to restore unnecessary forest interior, and secondary roads to promote watershed and resource protection. All off-road (ORV) and all-terrain vehicles (ATV) trails, and all unauthorized trails, will be eliminated to restore and protect refuge habitats and wildlife.
- Within 3 years of acquiring property that has access roads, logging roads, or skid trails, implement procedures to retire and restore any unnecessary roads to promote watershed and resource protection.

Implementing this program will support refuge goals 1-3 by protecting wetlands from erosion and sedimentation, by reducing transportation pathways for invasive species, and by helping to remove edge habitat.

**Unexploded Ordnance:
Public Safety and
Remediation**

As explained in chapter 2, “Affected Environment,” the refuge recently became aware of the presence of unexploded ordnance left over from military training activities during World War II on refuge lands. To what extent refuge lands were used for target practice activities is unknown. Therefore, under this management action, we will coordinate with the Army Corps of Engineers to develop a step-down management plan on unexploded ordnance in order to address public safety and remediation.

**Land Conservation
Partnerships**

We will continue to participate in land conservation partnerships with the goal to permanently protect and sustain Federal trust resources and other unique natural resource values in the Canaan Valley area and the Allegheny Highlands ecosystem. An important component of this commitment is to improve connectivity between existing conservation tracts and preserve public access. There is currently work towards encouraging conservation partnerships to evolve into a dynamic, landscape-level, multi-partner effort. The list of existing and potential partners is extensive and includes the Service, other Federal agencies, State agencies, private conservation organizations, local communities, private landowners, and private businesses. An example of these efforts is the CASRI a multi-agency, Non-Government Organization (NGO), and private land owner effort to conduct red spruce restoration throughout the Allegheny Highlands of West Virginia. Additionally, a public lands working group was established in 2007 to discuss conservation, public use, and other common issues with public land owners in the Canaan Valley area.

**Managing Conservation
Easements**

The refuge currently is responsible for the management of two separate easements totaling 44 acres. A conservation easement is a legal agreement voluntarily entered into by a property owner and a qualified conservation organization such as a land trust or government agency. The easement contains permanent restrictions on the use or development of land in order to protect its conservation values. One easement managed by the refuge is within Canaan Valley, while the other, a Farmer’s Home Administration (FmHA) easement is located in Crawley, WV. The refuge will still maintain management responsibilities for these easements including consultation with easement owners, invasive species control, inventory and survey requirements, boundary marking and law enforcement.

It is difficult to predict how much time and effort these responsibilities will require in the future. However, the refuge manager will continue to be responsible for managing conservation easements. If we were to begin sustained and systematic monitoring of these easements, rather than only the current opportunistic enforcement and invasive species control, the time commitment will be substantially greater than it has been to date. We do not anticipate having the staff available to monitor on a regular basis, but it is possible and desirable to begin a modest inventory, monitoring and invasive species control program on an annual basis on the easements.

The refuge will also consider additional conservation easements with private landowners. We will work with our realty office and other State, Federal and non-profit agencies to develop and leverage easement acquisitions when opportunities arise.

In the late 1980s to the mid-1990s, the Farmers Home Administration (FmHA) acquired many properties in central and southwest Virginia through foreclosure sales. Under the terms of a Memorandum of Understanding (MOU) between FmHA and the Service, a review team consisting of Service staff, and staff from the Natural Resources Conservation Service (NRCS), Farmers Home Administration, and Agricultural Stabilization and Conservation Service evaluated the properties for their conservation value. Based on the reviews, and prior to these properties being resold, permanent conservation easements were placed on some of these properties to protect wetlands and other important

wildlife habitats. Responsibility for enforcing and monitoring these easements rests with the Service, and that responsibility was delegated to the closest refuge manager.

The refuge staff has been conducting invasive species control operations at the Crawley easement as well as reposting boundaries and working with the land owners on trespass issues. Additionally, the staff was involved in working with the land owners to develop an access road to their home site within the easement boundary in 2001. These projects typically require two to three days of staff time to prepare for and conduct operations. In the past three years, the staff has spent an average of six staff days a year working on easement management issues.

The Service is in the process of reviewing and evaluating how refuges manage FmHA easements. Until a final decision is made on whether to change the status quo, we will continue to employ the following strategies to discharge our responsibilities in managing these easements:

- 1) Respond to reports of violations or possible violations as they become known. Work with landowners, utilizing partnerships where possible, to cooperatively resolve and remedy the violations. If necessary, work with the Regional Solicitor or US Attorney's Office to ensure remediation and future compliance; and
- 2) Develop a process to begin regular inventory and monitoring of FmHA easements so that each easement is visited annually. Work with partners and other Service offices to assist where possible. Conduct control operations for invasive species yearly on at least one visit.

Fire Management

The use of prescribed fire has been identified as a potential management tool for grassland and early successional habitat management in the CCP. The refuge will evaluate and use fire as a management tool when appropriate. Further details and guidance on using prescribed burns for habitat management can be found in the refuge's Fire Management Plan, which was approved in 2002 and revised in 2004. It is available by request (contact the refuge), or as a download on the planning website.



Prescribed burns

Climate Change

The refuge recognizes that conditions related to global climate change may affect our ability to meet long term biological objectives. Across the Appalachian region, current observations have shown average temperatures to have risen more than 1.5°F; winter average temperatures by 4°F. In general, spring is arriving earlier, summers are growing hotter, and winters are becoming warmer and less snowy.

Utilizing the TNC Climate Wizard program we analyzed the potential temperature and precipitation changes predicted for West Virginia by the year 2050 using an average of the three main climate models (MIROC3.2, CSIRO-MK3.0 and UKMO-HADCM3). Annual precipitation was predicted to increase an estimated 10 percent; however most change was predicted during the months December–May. The warmer months of the year June–August indicated a 0-3 percent decrease in precipitation from historic conditions. Additionally July temperatures showed an increase of about 5° F. The Climate Wizard modeling program is considered more accurate for prediction of future temperature change than for precipitation and mostly from a continental perspective. As such more specific predictions at the State scale must be viewed as a coarse estimation based on best available climate modeling at this time. Future information will continually be sought to evaluate and model the potential effects of climate change on refuge resources.

Field et al (2007) reports that several species of animals in North America are responding to the effects of climate change. For example the increase in average spring temperatures have led to earlier nesting for 28 migrating bird species on the east coast of the U.S. (Butler 2003) and to earlier egg laying for tree swallows (Dunn and Winkler 1999). Several frog species appear to be responding by initiating breeding calls 10 to 13 days earlier than a century ago (Gibbs and Breisch 2001).

Information from Audubon's Christmas Bird Count found 58 percent of observed species are wintering significantly more north in latitude over the past forty years. Rising winter temperatures create more suitable habitat for species which previously wintered in more southern locations (Audubon 2009). Recommendations include protection of migratory bird habitat and improve it's resiliency through increasing connectivity and condition of existing habitat (Audubon 2009).

Habitat specialists, like many peatland dependent bird species, are expected to be even more heavily impacted by climate change effects due to their increased sensitivity to vegetation changes. Areas such as Finzel Swamp in Maryland have been studied to analyze the local effect of the peatland community on the avian assemblages. Results indicated that Finzel Swamp and areas such as Canaan Valley currently provide refugia for a unique and distinct bird species which contribute to the avian diversity of the State and region. This diversity could be lost over time if temperature changes greatly influence the peatland community persistence in high elevation Appalachian wetlands. (Yeany 2009).

Another example of the possible effects of climate change on the region is found with predicted effects on stream temperatures and their subsequent impact on native fish species. The Intergovernmental Panel on Climate Change (IPCC) (2007) estimates that a significant increase in average annual air temperature is projected to eliminate a large percent of the habitat of brook trout in the southern Appalachian Mountains. This effect is predicted well outside the planning window for this document. However, some actions can begin now to help mitigate predicted temperature increases in the region, such as reforestation of riparian corridors to improve shading effects.

Areas like Canaan Valley that are experiencing changes in average temperatures could also serve as some of the more important and resilient areas of the Appalachians due to higher elevations, existing and potential future plant communities, and frost pocket conditions. For example, the refuge's active role in spruce restoration on the refuge and throughout the region is thought to be a way to help reduce the severity of climate stresses on the variety of rare and endemic species associated with these forests and high elevation wetlands. Increasing historic conifer cover in headwater streams may help reduce the overall warming effects and help maintain coldwater fisheries on the refuge such as brook trout and redbreasted dace.

Warmer winters and possible increased drought conditions could have the effect of increasing insect infestations on balsam fir, Eastern hemlock and American beech. The balsam and hemlock woolly adelgids which have infested stands of balsam fir and are beginning to affect hemlock stands in Canaan could increase in abundance with warmer winter temperatures and more generations may be produced if summer temperatures prolong the season. Drought conditions stress trees which can also increase their susceptibility to insect pests (IPCC 2007).

Maintaining and protecting the peatlands on the refuge will help regional carbon sequestration goals. Peatland communities are known to sequester greater amounts of carbon than other soil types. Analysis should be conducted to determine how climate change may influence the changes in peatland areas on the refuge, possibly moving them towards drier and therefore a more woody plant community type. If this occurs the potential conversion of peat soils may affect the amount of carbon sequestered in refuge wetlands.

Climate change will also likely create an increase in vegetative growth due to the increase of CO₂ in the atmosphere. With an increase in carbon dioxide one may expect an increase in photosynthesis and biomass production. Combining this information with predicted climate changes one may hypothesize that an increased vegetative productivity during a prolonged growing season combined with a possible decrease in summer precipitation could create drought stress conditions, particularly in the late summer. Increases in precipitation during the winter and spring months may exacerbate flooding conditions during snow melt.

Recommendations for forest management include planning for changes in plant communities and maintaining and increasing native and natural diversity to create a more resilient forest community. This may apply to the spruce forest habitat the refuge currently manages. Currently the spruce forest on refuge lands is fragmented and exists in relatively small patches. Through restoration work it may be possible to increase the patch size and connectivity closer to historic stable conditions of this northern forest type soon enough to help improve its resiliency to changes in average and seasonal temperature and precipitation patterns over the next 50 years.

Larger, mature trees with well established root systems will likely fare better during drought conditions than smaller less developed trees. Additionally a more mature and contiguous conifer cover in the higher elevations will help perpetuate cooler temperatures on the forest floor creating more conducive conditions for natural regeneration and perpetuation of associated wildlife such as the threatened Cheat Mountain salamander. Increasing the acreage of red spruce through restoration will likely increase the refuge's role in carbon sequestration as shade tolerant species like spruce are known to accumulate more carbon over time. Also, an increase in forest cover and mature forest stands will increase the carbon sink characteristics of the refuge forest habitat. Given the relatively high elevation and frost pocket conditions it is possible that habitats in Canaan Valley may develop into regionally significant refugia for vulnerable species.

Refuge plans for maintaining and increasing spruce cover fall into the category described by Millar et al 2007 as “resistance to change.” In this paradigm management of an ecosystem so that it is more suited to resist the influence or forestall the undesired effects of climate change is pursued. In the case of the red spruce ecosystem in the central Appalachians, this may be the best course to take given the high biological diversity and sensitivity of species tied to this ecosystem. Additionally, restoring areas historically in red spruce forest will help lend resilience to this forest ecosystem (Millar et al 2007).

Several species may be used to monitor the long term effects of climate change to the refuge’s biota. For example, spruce reliant song birds such as the blackburnian warbler may be an excellent indicator of the quality of the refuge’s conifer forest habitat relative to climate change. Balsam fir represents one of 109 plant species that have distinctly northern ranges but are able to persist in the Valley. Twenty-three of these species and varieties have been reported from five or fewer locations in West Virginia (Hudgins and Scott 1988). One or several of these plant species could be used for long term climate change monitoring. Focal species tied to these unique habitats are likely to be the “canary in the coal mine” for changes in habitats tied to climate change. The refuge’s list of focal species includes many of these and will incorporate their status into the continued adaptive approach to management during uncertain climate change scenarios.

The Service currently has a draft Strategic Plan for addressing climate change which will help guide refuge actions including planning, strategic habitat conservation, and adaptive management practices that will help us address climate change effects on refuge resources. Generally the refuge will continue to work with partners and encourage research and monitoring activities which will help build an information base with which to monitor changes and develop strategies to mitigate significant impacts over time. We will use adaptive management to evaluate conditions as they relate to our ability to meet our management objectives and integrate new management decisions into existing plans based on sound science and best professional judgment.

Wilderness Review

Refuge System planning policy requires that we conduct a wilderness review during the CCP process. The first step is to inventory all refuge lands and waters in Service fee simple ownership. Our inventory of this refuge determined that two areas met the eligibility criteria for a wilderness study area as defined by the Wilderness Act. However, the planning team decided not to recommend



Mary Konchar

Bobolink

wilderness designation at this time. The results of the wilderness review are included in appendix C.

Wild and Scenic River Review

Service planning policy also requires that we conduct a wild and scenic rivers review during the CCP process. We inventoried the river and river segments which occur within the refuge acquisition boundary area and determined that five river segments met the criteria for wild and scenic river eligibility. These river segments and their immediate environments were determined to be free-flowing and possess at least one Outstandingly Remarkable Value. However, we are not pursuing further study to determine their suitability, or making a recommendation on these river segments at this time because we believe the entire river lengths should be studied (not just those on refuge lands) with full participation and involvement of our Federal, State, local, and non-governmental partners. The results of our Wild and Scenic River inventory are included in appendix D. This management action will provide protection for free-flowing river values, and other river values, pending the completion of future comprehensive inter-jurisdictional eligibility studies.

Conducting Additional NEPA Analysis

NEPA generally requires site-specific analysis and disclosure of impacts in either in an environmental assessment (EA) or in an EIS for all major Federal actions. Other routine activities or general administration are categorically excluded from NEPA requirements to prepare detailed environmental documents.

Most of the major actions in this document are described and analyzed in enough detail to comply with NEPA, and will not require additional environmental analysis. Although this list is not all-inclusive, the following projects fall into that category:

- Opening the refuge to fishing by amending 50 CFR 32.68;
- Implementing changes to the hunt program within the scope of the 2007 hunt plan and EA;
- Creating a Research Natural Area; and
- Enhancing our priority public use programs.

Plans that have already undergone NEPA analysis include the current fire management plan (2004), the current hunt plan (2007) and the furbearer management and trapping plan (2004). Those environmental documents can be requested from refuge headquarters.

We recognize that some of the actions in this plan are not described in enough detail to comply with NEPA, largely because we did not have the necessary information at the time to provide these details. These actions, which will require further NEPA analysis, include:

- Create new trails and trail connections.
- Construct a parking area, platform and interpretive kiosk where A-Frame Rd. enters the refuge.
- Create new boat launch sites.
- Construct an environmental education pavilion on the Beall Trail in the vicinity of the Blackwater River.
- Convert Delta 13/Camp 70 into a road suitable for vehicular access.

We will pursue additional NEPA analysis on these actions once we develop more site-specific details.

Refuge Goals, Objectives and Strategies

Introduction

The following goals, objectives and strategies include an array of management actions that, in our professional judgment, work best towards achieving the refuge's purposes, vision, and goals, and will make an important contribution to conserving Federal trust resources of conservation concern in West Virginia and the central Appalachians. These management actions will most effectively provide low-impact, wildlife-dependent recreation and address the significant issues identified in chapter 2. We believe these management actions will enhance the quality, effectiveness, and sustainability of our management priorities. We also believe these actions are reasonable, feasible, and practical within the 15-year timeframe.

Our management direction as described below is designed to balance the conservation of a mixed forest matrix landscape with the management of early successional habitats and the protection of wetlands for which we believe the refuge can make the most important ecological contribution within the Canaan Valley watershed, Allegheny Highlands and the Refuge System. The habitat types we describe support a wide variety of Federal trust resources, in particular, birds of conservation concern identified in the BCR 28 region, Physiographic Area 12 and wetlands. For each habitat type objective we identify "focal species", whose life and growth requirements will guide management activities in that respective habitat type. Focal species were selected because they are Federal trust resources, identified as priorities in local or regional resource planning documents, or Canaan Valley provides significant habitat for populations of those species. Focal species represent species whose habitat needs, in our opinion, broadly represent the habitat requirements for a majority of other Federal trust species and native wildlife and plants dependent on that respective habitat type. See appendix E for a full description of the process for selecting focal species and priority habitats for the refuge. Our management direction also addresses the Refuge System's mandate to consider managing refuge habitat under the Biological Integrity and Diversity and Environmental Health policy (601 FW 3) (2001).

Under this management direction the refuge will attempt to increase deer harvest by facilitating the removal of more deer from the refuge and by opening more tracts to rifle use. We will officially open the refuge to fishing by amending 50 CFR 32.68, and we will promote fishing opportunities. To facilitate opportunities for wildlife observation and photography we will create trail connections that will offer longer trail routes and that will allow users to travel from the north end of the refuge to the south end, and vice versa, while mostly staying on refuge lands. We will expand the visitor center hours and we will build a new environmental education pavilion. We will also increase the number of environmental education and interpretation programs being offered on and off the refuge. As a result of this increase in infrastructure for visitor services we expect that visitor use will increase by 15 percent.

In this CCP we present a staff of 12.5, which is the recommended number of positions in the 2008 staffing model. Staffing models were developed to answer the following basic question: "What level of staffing is needed to operate and manage a station to achieve the station's purpose, contribute to the mission and goals of the Refuge System, and comply with the Refuge Improvement Act and other laws, regulations, and policy?" Earlier efforts suggest there are 10 functional categories that describe the work we do or need to do on stations in the Refuge System. These are: wildlife and habitat, visitor services, facilities and equipment, maintenance, realty, planning, communications, business

management, information technology, law enforcement, and fire management. The model gives a total number of full time employees needed at a station to do the work, but management must still decide the best mix of disciplines to do that work and whether to deploy part-time, seasonal or permanent employees. To support the expanded biological and visitor services programs in this CCP, we will convert our administrative assistant and park ranger term positions into full time, permanent positions, and we will add a refuge operations specialist position, a permanent seasonal maintenance worker, a permanent park ranger position, and a permanent biological technician.

Map 4-1 illustrates the refuge's predicted habitat management strategies, map 4-2 illustrates the predicted refuge hunt strategies, and map 4-3 illustrates the predicted public use strategies.

GOAL 1

Maintain and perpetuate the ecological integrity of the Canaan Valley wetland complex to ensure a healthy and diverse wetland ecosystem providing a full range of natural processes, community types, and native floral and faunal diversity.

Objective 1.1 (Forested, Shrub and Herbaceous Wetlands and Open Water)

Within 15 years, maintain and improve the biological integrity, diversity and environmental health of the 5,573-acre refuge wetland complex and prioritize management actions to improve an index of ecological integrity by 10 percent, to limit invasive plant infestation to standards established by NatureServe, and to limit excessive deer browse which inhibits natural succession and regeneration. Management will emphasize and reflect the composition, function and diversity of this habitat type as it will occur under natural environmental influences.

Rationale

The refuge currently protects 5,573 acres or 67 percent of all wetland habitats within the Canaan Valley watershed. The wetlands of Canaan Valley represent almost 30 percent of the total wetland acreage in the State (Evans et al. 1982).

As early as 1974, Canaan Valley was officially recognized as a regionally significant wetland area through the designation of 15,400 acres as a NNL, administered by the Park Service. The extensive wetlands and diversity of plant species, particularly plants more typical of northern latitudes, were cited as the primary purposes for the NNL designation (NPS 2000).

In all of the founding documents including the 1979 EIS and 1994 EA, the importance of the wetlands was emphasized as a reason for establishing Canaan Valley refuge:

- "Canaan Valley's wetland and wildlife habitat resources are considered nationally significant." (USFWS 1994b, USFWS 1994c).
- "(Canaan Valley's wetland area)...is listed as a priority for protection in the Service's Regional Wetland Concept Plan, and considered by the State of West Virginia as the most important wetland in the State." (USFWS 1994b, USFWS 1994c)
- "... (Canaan Valley)...contains the largest known freshwater wetland area in the central and southern Appalachians" (NPS 2000).
- "The purpose of the refuge acquisition is to insure the ecological integrity of Canaan Valley and the continued availability of its wetland, botanical, and wildlife resources to the citizens of the United States" (USFWS 1979).

The importance of protecting wetlands in Canaan Valley was further defined through one of the enabling legislative acts, the Emergency Wetlands Resources Act, used to establish the refuge and further detailed in Chapter 1.

Wetland habitats are considered critical components of functioning ecosystems. The State Wildlife Action Plan (2006) notes that wetland habitats harbor up to 23 percent of the State's plant species and that wetlands are one of the State's most critically important habitat types. Because less than one-half of one percent of the State's land area occurs as wetlands, those communities and related species are of high conservation value. Wetland types are also noted as rare community types in the USFS Monongahela Forest Plan (USFS 2006). These facts emphasize the importance of the refuges' role in the State's wetland protection and conservation efforts.

Maintaining and perpetuating the ecological integrity of the wetland complex in Canaan Valley fits well with the Refuge System's Biological Integrity, Diversity, and Environmental Health Policy (601 FW 3). This policy prescribes that refuges maintain and restore, where appropriate, the "biological integrity, diversity, and environmental health" of the Refuge System. It provides refuge managers with an evaluation process to analyze each refuge and recommend the best management direction to prevent further degradation of environmental conditions, and where appropriate and in concert with refuge purposes and System mission, restore lost or severely degraded components. By providing for the full range of natural processes and native floral and faunal diversity, the refuge will be implementing the policy.

The primary known threats to the ecological integrity of the wetland complex in Canaan Valley are past land use practices (including excessive and destructive public use), an unchecked beaver population, an abundant white-tail deer population, invasive and exotic pests, and atmospheric deposition. We developed management strategies to ensure that these specific threats, with the exception of atmospheric deposition, are addressed. To identify, prioritize, and abate the most important of these and other unknown threats to the integrity of the wetland complex, we will develop an index of ecological integrity. Once created, adaptive management actions will strive to improve the index score over the 15 years of this comprehensive plan.

Invasive pest control, hydrologic restoration, and deer abundance reduction are targeted as important management actions prior to the creation of the index of ecological integrity. Invasive plant species such as purple loosestrife, Japanese knotweed, garlic mustard, and Japanese stiltgrass pose imminent threats to the wetland communities. These species have been documented within Canaan Valley or Tucker County, but have limited occurrence on the refuge. By thorough monitoring and rapid control, we will contain their spread to no greater than the thresholds established for individual invasive species by NatureServe, (Faber-Langendoen et al 2008) with emphasis on controlling their encroachment into sensitive or rare plant communities. According to the NatureServe protocol, areas are ranked "excellent" to "poor" based on the percent total abundance (percent of invasive species relative to the native species) of key invasive plant species. A threshold of 3 percent total abundance is cited as "good" and will be applied to invasive plant species such as purple loosestrife or Japanese knotweed which are a particular threat to the refuges' habitats. We will strive to prevent any new occurrences of invasive plants that are already below a 3 percent total abundance threshold, and we will not allow plants to exceed a 3 percent threshold once they are established.

Historical land use practices have altered the hydrologic regime of the wetlands and adjacent slopes draining to the wetlands. Impact reports of past off-road-vehicle (ORV) use in Canaan Valley detail direct loss of vegetation, colonization by non-native plant species and excessive erosion (Stout 1992, USFWS 1993). Railroad grades, roads, and trails impede the flow of surface and subsurface water in some areas, channelize water flow in others, impound water, and accelerate soil erosion and stream sedimentation. Bartgis and Berdine (1991) note that roads and trails divert water from their original drainage patterns in Canaan Valley. This can result in some drainages becoming drier while others accelerate erosion by being forced to carrying more water.

Zeedyk (2002) documented many instances in Canaan Valley where existing roads and trails were channeling water away from historical wetlands and in some cases causing erosion and sedimentation of bog and other wetland communities. These problems have “profoundly if not irreversibly altered” the extent, depths, characteristics, and function of the wetlands on the Main Tract (Zeedyk 2002). Although some of the impacted areas may have stabilized since their disturbance, identifying and remediating the sources of continuing degradation is a high priority in restoring the environmental health of the wetland complex.



Mary Konchar

Whitetail deer

Deer abundance appears to have suppressed woody regeneration in Canaan Valley following logging in the early 1900s and the livestock grazing in the mid- to late-1900s. Observations from deer exclosures in Canaan Valley show a marked increase in number, height, and diversity of woody stems inside the exclosure compared with similar habitat outside the exclosures (USFWS 2006a). Recent observations from a forest inventory study indicate a lack of seedling hardwoods developing in the refuge forest understory. For example only 5 percent of inventoried northern hardwood and cherry forest plots had greater than the necessary number of regenerating stems per plot to be considered to have adequate small advanced reproduction (USFWS 2006a).

Studies of deer herbivory of Jacobs’s ladder, a priority conservation plant species (G3-globally vulnerable), show that browse impacts can be significant. Flaherty (2006) found some Jacob’s ladder with up to 69 percent of flowering stems browsed on the refuge. Browse rates this high, if continued over many years, could limit natural reproduction and the expansion or even replacement of plants within a population. Deer herbivory, when browse pressure is high, can alter the growth, reproduction and ultimately survival of plants within a specific population (Alverson and Waller 1997, Cote et. al 2004). The browse pressure that the deer population exerts in Canaan Valley may threaten the reproduction and persistence of sensitive plant species and the processes of natural succession and woody encroachment.

Literature suggests that high deer densities impact woody regeneration in central Appalachian hardwood forests. Altered species composition and reduced diversity of woody and herbaceous plant species were found at densities over 20 deer per square mile (deCalesta 1994). Locally, deer were found to impact balsam fir regeneration in Canaan Valley (Michael 1992b). Deer densities based on number of bucks killed per square mile differ and range from 17 to over 30 on refuge lands between 2002 and 2006 (WVDNR, USFWS unpublished data). Surveys conducted in the Timberline Homeowners development by the WVDNR estimated

46 deer per square mile in 2003 and 59 deer per square mile in 2004. Current management of deer in Tucker County targets a density of 25-30 per square mile (Taylor 2009). Refuge observations and forest inventory data suggest that current deer densities are affecting balsam fir survival and impacting forest understory development. Managing the deer population to maintain species diversity and natural processes is an integral component of maintaining the health of the wetland complex.

Strategies:

Within 0-3 years of CCP approval:

- Identify locations where existing railroad grades, road grades, and trails have altered natural hydrologic processes such as surface and sub-surface water flow, evaluate those sites where remediation will benefit the wetland complex, and prioritize these sites for remediation. Methods will include but are not limited to the placement of culverts and permeable fill to restore flow through developed grades and trails, breaching roads, trails and rail grades blocking flow, recontouring and filling deeply incised areas.
- As part of the Habitat Management Plan (HMP) process, develop individual, site specific restoration plans that will maintain and/or improve the integrity of the wetland complex.

Within 3-5 years of CCP approval:

- Remediate, where appropriate, identified impacted areas so that natural processes are restored and soil erosion is reduced. Incorporate prescriptions and implementation strategies in HMP and Annual HMP as appropriate.
- Identify appropriate ecological integrity index metrics that measure both the intrinsic value of the wetland complex as well as the wildlife species that depend on these habitats. Perform initial measurements within palustrine and riparian communities. Facilitate partnerships and research to guide the development of the index and monitoring metrics and improve our knowledge and understanding of the wetland complex.

Within 5-10 years of CCP approval:

- Evaluate effectiveness of the monitoring protocol and integrity index, and determine appropriate time interval for continued long-term monitoring.

Within 10-15 years of CCP approval:

- Continue long term monitoring of integrity index metrics, implementing changes as appropriate to adapt to new information and monitoring results.

Throughout the Life of the CCP:

- Map and evaluate wetland areas impacted by erosion, sedimentation and hydrologic disturbance.
- Minimize all refuge activities that will cause unnecessary disturbance to refuge wetland communities.
- Conduct breeding bird surveys in wetland communities to monitor trends especially for birds of conservation concern.
- Work with partners (universities, colleges, NGOs, and Federal and State agencies) on wetland monitoring and research projects.
- Conduct biannual breeding amphibian call surveys and annual vernal pool monitoring.

- Permit and encourage deer hunting, particularly for does, on refuge land with a goal to maintain a population no greater than the ecological carrying capacity of the landscape. See goal 4, Objective 4.1, for specific strategies on managing the refuge's deer population.
- Work with the WVDNR and surrounding land owners to encourage increased deer harvest, particularly for does, on lands adjacent to the refuge. See goal 4, Objective 4.1, for more details.
- Conduct baseline inventory and monitoring projects in coordination with State and regional wetland inventory and research initiatives. Projects may include amphibian nesting and anuran breeding surveys, and dragonfly inventories.
- Conduct annual deer herd surveys for density estimation.

Objective 1.2 (Forested Wetlands)

Manage and protect 132 acres of wetland conifer forest and woodland to perpetuate their associated flora and fauna, prevent inundation by beaver activity over 10 percent of the land area of these communities for greater than 2 years, and conduct restoration activities where practical to ensure regeneration, natural succession, and persistence of these communities. Benefiting species of concern include balsam fir, Blackburnian warbler, Canada warbler, and Indiana bat.

Rationale

A small portion of refuge wetlands are currently forested with red spruce, eastern hemlock, balsam fir, and associated species, compared to the reports from the late 1800s of the extensive red spruce forests throughout the valley. Recent modeling efforts conducted in collaboration with the multi-agency high elevation conifer work group indicate that Canaan Valley likely supported the greatest extent of wetland conifer forests in the State prior to logging activities. Today 2 percent, or 132 acres, of the refuge wetlands are coniferous forest. Red spruce, balsam fir, and Eastern hemlock are the dominant species in this forest type. Red maple, black ash, serviceberry, black cherry, yellow birch and mountain ash are co-dominants. These forests occur on low lying wetland sections of the refuge's Freeland and Cortland Tracts, along the major riparian corridors such as the Blackwater River through Middle Ridge and in isolated low-lying seep and riparian areas throughout the Main Tract, which is the 9,176-acre tract of land in the northern part of the refuge.



Steve Maslowski/USFWS

American black duck

The spruce-fir swamp communities are rare within the State, region, and worldwide. NatureServe lists the five conifer swamp associations occurring in Canaan Valley as S1-S2 (vulnerable to highly vulnerable to extirpation in the State) and G1-G3 (somewhat to highly vulnerable to extirpation globally). A survey of plant communities in the

Allegheny Mountain Section of the Central Appalachians listed Canaan's conifer swamps as rare because of the limited distribution of wetlands within the region and the presence in Canaan's wetlands of regionally rare plants (Fortney et al. 2005). Community types recognized by the WVCAP associated with these wetlands (floodplain forests and swamps, high Allegheny swamp) are listed as high to very high conservation priorities (WVDNR 2006). For example, balsam fir, a dominant canopy species in nearly 20 acres of forested wetlands, is a State species of concern and is nearing the southern extent of its distribution in Canaan Valley.

The conifer swamps harbor many wildlife species considered by the State as "Species in the Greatest Need of Conservation" and by PIF as priority migratory bird species for BCR 28. These species include Canada warbler, Blackburnian warbler, and mammals such as southern watershrew, bog lemming, Appalachian cottontail, and possibly the Federally endangered Indiana bat (PIF 2003, Rich, T.D. et al. 2004, WVDNR 2006).

The known threats to the conifer swamps are invasive insect pests, invasive exotic plants, an unchecked beaver population, an abundant white-tail deer population, and atmospheric deposition. A narrow ecological niche for balsam fir wetland communities and the restricted range of red spruce and balsam fir to the high elevations in the Central Appalachians also limit the conifer swamps. The threats from and management strategies for invasive plants and deer browse pressure are addressed in Objective 1.1.

Exotic pest control is an important management action to perpetuate the conifer swamp communities. Balsam and hemlock woolly adelgid are immediate and severe threats to the balsam fir and hemlock components, respectively, of the forested wetlands. Since its arrival in Canaan Valley in the mid-1990s, balsam woolly adelgid has infested all balsam stands, resulting in a decline in the number of live balsam firs, killing approximately 30 percent of the mature balsams between 1995 and 2005, and limiting reproduction and regeneration. Because of the limited distribution of balsam fir in the State, apparent complete adelgid infestation of fir throughout the State, and lack of regeneration, management concern for balsam fir communities has increased.

Hemlock woolly adelgid is also an immediate and severe threat to the hemlock component of the forested wetlands. Hemlock woolly adelgid arrived in Canaan Valley in the early 2000s, but appears to be moving slowly through the hemlock population. Little mortality from hemlock woolly adelgid is known from Canaan. No effective treatments for these pests in native, dispersed wetland stands are known. Encouraging the refuge to serve as an experimental control site or using approved biological, chemical, or mechanical control methods for the adelgid helps promote the persistence of two important components of the wetland conifer swamps.

In addition to the impacts of the balsam and hemlock woolly adelgids, deer browsing eliminates many of the naturally regenerating balsam and hemlock seedlings. Reducing deer browse in Canaan Valley helps ensure the regeneration of balsam, hemlock, and their associated forested wetland species. Planting balsam seedlings grown from seeds collected in Canaan Valley and grown in nurseries maintains an important component of the conifer swamp communities and maintains the unique local genotype of this species. Deer exclosures help protect natural and planted seedlings within existing and historical balsam fir stands. Without active management to replace seedling presence, balsam communities will develop into even-aged stands, highly susceptible to adelgid infestation without younger trees to replace them. Many stands on the refuge

suffering from adelgid infestation have become highly susceptible to wind-throw events. This opens the canopy and permits new seedling growth of typically browse resistant woody species. Without seedling replacement and understory establishment through planting efforts, a dramatic shift in the wetland forested community and loss of the balsam fir component will likely result.

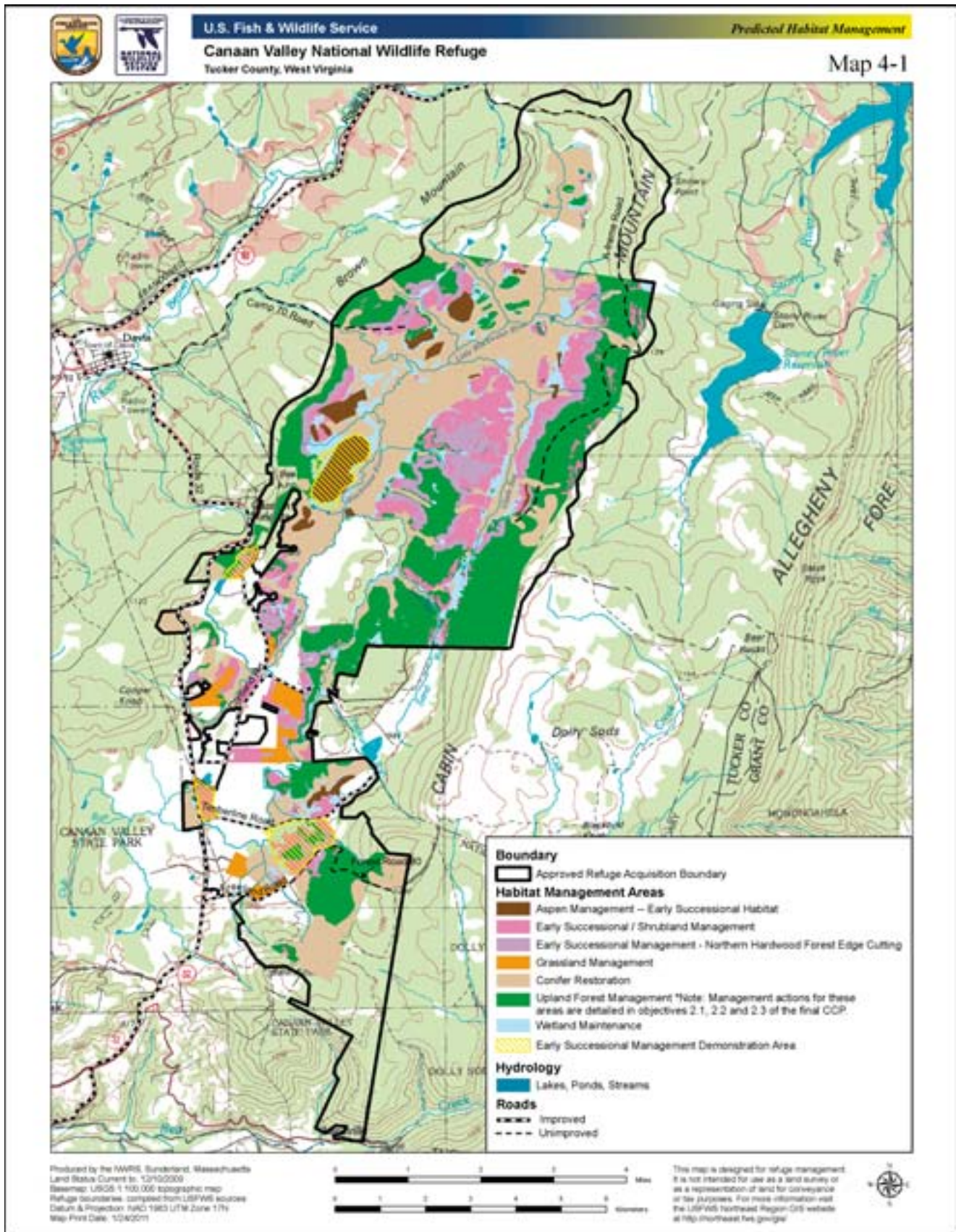
Restoration efforts for areas which are currently forested and areas which were historically forested but have not regrown since the historical logging and fires will be evaluated during the HMP process for management actions. Locations of existing conifer forest will be priority sites for restoration planting to increase the areal extent of and connectivity between patches. Potential restoration sites for conifer forest are identified on Map 4-1 and include both upland and wetland sites. Identified areas on the map generally indicate locations within which the refuge will consider conducting conifer forest restoration management actions. Much of the wetland habitat which was formerly conifer/mixed hardwood swamp forest historically, likely could not support a self sustaining forest at this time. Fires and logging activity followed by years of grazing in some areas have created conditions not suitable for natural tree succession. We will consider site suitability, ecological context and practicality measures while making the decision for locations of restoration actions.

Beaver activity and the flooding of low lying areas is a natural and important disturbance process in Canaan Valley. The natural landscape mosaic of flooded areas and old ponds in various stages of succession maintains a diversity of plant communities unique to Canaan Valley and provides niches for several uncommon plant species. With few natural predators, however, the beaver population threatens sensitive plant communities with prolonged inundation. Bottomland forested communities, especially balsam fir stands, are particularly vulnerable due to their limited distribution and have experienced a 40 percent reduction in area between 1975 and 1997 (Fortney and Rentch 2003). Limited and regulated trapping of beaver ensures the protection of targeted wetland plant communities and species of concern (Bonner 2005). The refuge initiated a beaver management program through the development of a furbearer management plan



Ken Sturm/USFWS

Tree chewed by beaver



and environmental assessment, approved in 2003. Beaver management is aimed at reducing the threat of inundation of rare plant communities by proactively trapping through a special use permit issued by the refuge.

Balsam fir is singled out in this objective as a species of concern because of its rarity in the State (it is on the southern edge of its distribution), and because of the diversity of threats impacting the population's persistence in Canaan Valley. Balsam woolly adelgid causes mortality of mature trees, limiting reproduction and regeneration. Deer browsing eliminates many of the naturally regenerating balsam seedlings. Perpetuating this species in Canaan Valley protects an important component of the most vulnerable conifer swamp communities and maintains the unique local genotype of this species. Current partnerships have successfully funded the collection and propagation of local balsam fir stock for restoration purposes on the refuge through a combination of volunteer support, staff time, grants, and limited station funds. Restoration work to conserve balsam fir as a species and as part of a rare plant community will continue to be an emphasis on refuge lands. Future restoration work may require additional funding emphasis from the refuge if balsam fir resumes a precipitous decline as was seen in the early 2000's.

The Indiana bat is a Federally listed endangered species and a trust resource of the Service. Primary foraging habitats include wetland and riparian areas, bottomland forests and edge habitats. Roost trees are typically in wooded wetlands, bottomland and floodplain forests, as well as upland habitats. Habitat loss and degradation, overutilization for scientific purposes, disease and predation, environmental contaminants, and the inadequacy of existing regulatory mechanisms for summer habitat threaten the population viability of the Indiana bat across its range. The Indiana Bat Draft Recovery Plan (USFWS 2007a) calls for the conservation and management of hibernacula and adjacent lands, summer habitat, and winter populations, for the monitoring of populations on Federal lands, and for the development of public outreach and information programs (Recovery Actions 1, 2, and 4). If Indiana bats are using the refuge for foraging and roosting, then protecting, maintaining, and improving habitat quality on the refuge will contribute to the viability of the species and its recovery. The conservation of this endangered species is now more important than ever as white nose syndrome spreads across the range of the Indiana bat.

Acoustical recordings from 2003, 2006, 2007, and 2008 suggest Indiana bats are using riparian corridors and beaver ponds on the refuge for summer foraging habitat. Mist-netting will provide visual confirmation of their presence, reproductive information, the types of refuge habitats used, and the seasons they are using the refuge habitats. Summer use indicates a potential for maternity colonies to be located on or near the refuge. As a key stage in the life cycle of the species, it is imperative to know the location of maternity colonies and protect them from disturbance. Radio telemetry of lactating or recently lactating female bats found on the refuge will define the habitats and locations that are important for this endangered species.

Gathering more information about use of the refuge by this endangered species will allow more informed management decisions and ensure the protection and improvement of habitats used as roost or maternity colonies.

Strategies:

Within 0-3 years of CCP approval:

- Identify, map, and prioritize communities and locations where no more than 10 percent loss of forested wetland plant communities from inundation by beaver activity will be tolerated.

- Survey for Indiana bat presence and habitat use using mist nets and acoustic monitoring equipment along 90 percent of riparian and wetland communities and determine appropriate conservation and management actions.
- Contact agency partners and other organizations to find training to develop expertise within refuge biological staff to operate acoustical monitoring devices, conduct mist net surveys, correctly identify bat species by sound and sight, and receive the appropriate permits for handling the species.
- Determine summer roosting and foraging locations in Canaan Valley using radio telemetry of Indiana bats captured in mist nets.

Within 5-10 years of CCP approval:

- Assess the quality and extent of any occupied Indiana bat habitat and implement forest management techniques to improve the quality of at least 20 percent of potential habitat. This may include creating areas of standing dead hardwood trees near wetland and riparian habitat by selective girdling operations.

Throughout the Life of the CCP

- Work with volunteers to support bi-annual spruce and fir planting projects in wetland and riparian communities.
- Support cone collecting and seed extraction of conifer species through volunteer support.
- Partner with the U.S. Department of Agriculture (USDA) NRCS (Alderson, WV) to store and propagate conifers for restoration purposes.
- Focus planting on habitats currently supporting small aggregations of spruce and fir.
- Support conifer planting efforts through grant funding with minimal use of station funds.
- Work with university partners and other researchers to evaluate spruce restoration techniques and prioritize locations for restoration activities.
- Participate in the multi-agency Red Spruce MOU.
- Maintain and monitor balsam fir exclosures to evaluate impacts of deer browse on balsam fir reproduction, growth and the success of associated wetland plant species.
- Conduct beaver pond use and development surveys focused in high priority locations to determine potential of community loss through beaver activity.
- Issue special use permits for people to trap beaver in order to prevent prolonged inundation of high priority locations as directed by refuge staff. Beaver trapping will be strictly a management action tied directly to the protection of rare plant communities and refuge infrastructure as outlined in the furbearer management plan.
- Perpetuate conifer wetland forest by working with partners to propagate and plant Canaan Valley balsam fir and red spruce within the extent of current and historical ranges.
- Work with partners to evaluate and implement methods for controlling balsam woolly adelgid.

Objective 1.3: (Shrub and Herbaceous Wetlands)

- Construct deer exclosures when necessary to protect balsam seedlings from deer browsing.

Manage and protect 5,060 acres of wet shrublands and herbaceous wetlands to perpetuate their associated flora and fauna, prevent inundation by beaver activity over 10 percent of the land area of these communities for greater than 2 years, and conduct restoration activities where practical to ensure regeneration, natural succession, and persistence of these communities. Benefiting species of concern include alder flycatcher, American woodcock, pink-edged sulfur butterfly and many herbaceous wetland plant species.

Rationale

Like the forested wetlands discussed in Objective 1.2, the shrub and herbaceous wetlands are both maintained over time by and susceptible to inundation by beaver activity. Beaver activity and the flooding of low lying areas is a natural and important disturbance process in Canaan Valley. The natural landscape mosaic of flooded areas and old ponds in various stages of succession maintains a diversity of plant communities unique to Canaan Valley and provides niches for several uncommon plant species. With few natural predators, however, the beaver population threatens sensitive plant communities with prolonged inundation. Limited and regulated trapping of beaver ensures the protection of targeted wetland plant communities and species of concern (Bonner 2005).

See also rationale for Objective 1.2.

Strategies:

Within 0-3 years of CCP approval:

- Identify, map, and prioritize communities and locations where no more than 10 percent loss of shrub/herbaceous wetlands from inundation by beaver activity will be tolerated.
- Conduct bimonthly acoustical monitoring surveys (May-September) along streams and beaver ponds to detect presence of Indiana bats.

Throughout the Life of the CCP

- Map and evaluate wetland areas impacted by erosion, sedimentation and hydrologic disturbance.
- Minimize all refuge activities that will cause unnecessary disturbance to refuge wetland communities.
- Conduct breeding bird surveys in wetland communities to monitor trends especially for birds of conservation concern.
- Work with partners (universities, colleges, NGOs, and Federal and State agencies) on wetland monitoring and research projects.
- Conduct biannual breeding amphibian call surveys and annual vernal pool monitoring.
- Plant alder seedlings to increase patch size and management capability of alder/tall wetland shrub habitat.

Objective 1.4: (Open Water/Aquatic)

Manage and protect 55 miles of stream and a dynamic beaver pond system (currently 85 acres) for cold water fish species and breeding and foraging migratory birds by ensuring adequate riparian cover, limiting anthropogenic disturbance, and allowing the process of beaver pond formation and succession to occur naturally. Benefiting species include brook trout, reddsides, American black duck, American bittern, wood duck, and southern water shrew.

Rationale

Streams, rivers, beaver ponds, and other open water bodies in Canaan Valley provide habitat for species of concern such as brook trout, redbreasted dace, black ducks, wood ducks, and American bitterns. High quality wetland and cold water riparian habitat is scarce and frequently degraded in the State and in the High Allegheny Plateau region of the Central Appalachians. Degraded riparian habitat in West Virginia is noted to be the second greatest environmental stressor in the State and within the Mid-Atlantic highlands overall. West Virginia has a low percentage of wetland acres and has lost an estimated 24-57 percent of historical wetland communities from development and alteration (WVDNR 2006). Wetlands are considered uncommon and are noted as extremely important for wetland dependant plant and wildlife communities (WVDNR 2006, Tiner 1996). As the largest wetland in the State with the headwater tributaries to the Blackwater River, Canaan Valley is an important resource for maintaining open water-dependent species.

Brook trout are an indicator species for the quality of the cold water fisheries in the region. Although once abundant, channelizing and impounding of streams, logging that removed shade and cover from streamsides, soil erosion, sedimentation, acid mine drainage, and competition from non-native fish has led to the extirpation of brook trout in 25 percent of the streams in its historical range in West Virginia. The remaining population is classified as "Greatly Reduced" with 85 percent of brook trout existing in highly fragmented populations lacking connectivity to other suitable or occupied stream segments (Hudy et al. 2005). Redbreasted dace, a species with similar habitat requirements that is rare in the State, likely faces similar reductions in population size and connectivity as a result of habitat fragmentation and degradation. This species was reportedly common in Canaan Valley in the 1940s and 1950s but is currently rare with documented population declines since 1978 (Cincotta et. al 2002).

The refuge was established in part to protect the valley's cold water habitats and their associated ecological systems. One of the founding authorities (Emergency Wetlands Resources Act of 1986, 16 U.S.C. 3901-3932), the final EIS (USFWS 1979), and final EA (USFWS 1994a) for the establishment of the refuge, point to the conservation of wetlands, protection of water quality, and preservation of cold water fisheries as a primary focus for refuge management. The continued degradation of habitat in the region and subsequent fragmentation of the brook trout populations warrants an ongoing focus in refuge management for protecting cold water habitats. The Service, Eastern Brook Trout Joint Venture, and the WVDNR recognize the importance of this focus and similarly emphasize the protection, restoration, and maintenance for populations and habitats of brook trout and other aquatic species of concern (Moss et al. 2007, EBTJV 2007, and WVDNR 2006).

There are eight tributaries either entirely or partially on the refuge which have current or historical records for brook trout. Those streams or sections of stream outside of refuge boundaries can be focus areas for joint habitat management projects to protect water quality and the riparian corridor. Areas on the refuge which have historical records for brook trout should be evaluated for water quality and the associated riparian forest cover for possible management actions.

Increasing forest cover of riparian corridors protects water quality for aquatic species such as brook trout and redbreasted dace by shading streams (slowing heat gain), reducing sedimentation, and providing woody debris for habitat structure. A 100 meter forested or tall shrubland buffer on each side of perennial, intermittent, and ephemeral streams exceeds the West Virginia DEP's recommended 30 meter buffer for erosion control and sedimentation and provides

the shading, stabilization, and woody debris inputs that benefit cold water fish habitat (WVDOF 2001, EBTJV 2005). A forested buffer, when greater than 90 percent canopy closure and at least 25m wide on each side of the stream, allows the stream to retain normal stream temperature behavior with minimal daily and seasonal temperature fluctuations (Wilkerson et al. 2005). Wider riparian forest corridor widths support greater numbers of breeding birds, especially those considered area-sensitive species (Peak and Thompson 2006, Fischer 2000). Using the 100 meter width will ensure that riparian corridors protect aquatic habitats and improve migratory bird habitat. Limiting gaps in canopy cover along a stream to less than 100 meters allows the stream to recover to near normal temperature behavior if the stream subsequently flows through closed canopy forest (Wilkerson et al. 2005).

Sedimentation of streams from upland soil erosion and disturbance inhibits the development of brook trout eggs and reduces reproductive success. Small amounts (<1 percent) of fine sediment (<0.063mm) in the spawning bed substrate can negatively impact brook trout recruitment in Appalachian headwater streams (Hartman and Hakala 2006). Rehabilitating the extensive logging roads, skid trails, railroad grades, and currently degraded streams can decrease sedimentation and allow for greater reproductive success and potential new restored habitat for brook trout and redbreasted dace. The restoration of degraded wetland and upland areas is addressed in Objective 1.1.

Improving riparian forest cover also provides habitat for a diversity of other wildlife species including migratory birds, amphibians, and mammals. Studies indicate that increasing riparian area increases avian species richness (Stauffer and Best 1980; Triquet, McPeck, and McComb 1990; Keller, Robbins and Hatfield 1993; Kilgo et al. 1998) and that narrow buffer zones are less likely to contribute to high water quality goals (Houlahan and Findlay 2004). Semlitsch (1998) recommended riparian buffer strips greater than 165 meters to maintain viable populations and communities of Ambystomatid (mole) salamanders and to maintain the connection between wetlands and terrestrial habitats to preserve the biodiversity of remaining wetlands. The range of recommended widths of riparian habitat for birds is broad. Fischer and Fischenich (2000) cite recommendations that range from 15 meters for stopover use during migration, to 100 meters to maintain nesting habitat for area sensitive species of birds. Kilgo et al. (1998) recommended the width of bottomland hardwood forest to be at least 500 meters to maintain a complete avian community.

American black ducks, American bitterns, wood ducks, and other waterfowl use the headwater wetlands and impounded water of beaver ponds in Canaan Valley during migration and the breeding season. The scarcity of suitable habitat within the State and range-wide population declines places black ducks and bitterns on the State species of concern list. Wetland habitats are noted as a high conservation priority in the WVCAP and provide habitat for a large number of species listed as State conservation priorities. As the largest wetland in the State harboring these sensitive species, the refuge can play an important role in the protection and management of naturally functioning open water wetland habitats. Open water habitat is relatively rare and isolated in the valley, being formed by beaver activity and to a lesser extent historical railroad and road grades impounding water flow. Acreage of pond habitat changes over time as beaver populations fluctuate.

In addition to the primary refuge purpose directing wetland conservation (Emergency Wetlands Resources Act of 1986, 16 U.S.C. 3901-3932), the final EA (USFWS 1994a) prepared prior to land acquisition lists as an objective providing and developing habitat for waterfowl consistent with preservation of existing ecosystems. Protecting the streams and the open water habitat created by beaver



Ken Sturm/USFWS

Glade Run wetlands

ponds for breeding and migratory waterfowl on the refuge continues to be a high priority, as it provides habitat otherwise scarce in the region. Actively creating impoundments to further maximize species productivity, however, is precluded by the importance of protecting the unique wetland system that is maintained by the naturally occurring and succeeding beaver ponds. The formation of new beaver ponds, desirable for the creation of waterbird habitat, may directly conflict with other priorities of the refuge and the persistence of sensitive plant communities. The protection of rare plant communities (forested wetlands) from beaver pond inundation is addressed in Objective 1.2.

Protecting open water habitats is important for the variety of wildlife and plant communities that rely on these limited habitats on the refuge. Disturbance and harassment of breeding waterbirds can be an important stressor affecting their foraging behavior and reproductive success. Due to the limited quantity of pond habitat on the refuge, these areas could have a disproportional amount of disturbance associated with fishing or other recreational activities.

Disturbance to waterfowl from recreational fishing access is of particular concern because fishing is permitted year-round in West Virginia. Humans walking off-trail have been shown to cause greater disturbance (greater area of influence, flush distance and distance moved) to wildlife than walking within trail corridors (Miller et al. 2001). Predictability of disturbance (on trail vs. off trail) has been cited as a major factor in impacts to wildlife. Walking off trail is considered less predictable to wildlife and typically more disruptive (Trails and Wildlife Task Force 1998, Miller et al. 2001, Knight and Cole 1991). Requiring anglers to use designated public use trails to access fishing areas will help limit this type

of disturbance. Nonetheless, once anglers access pond habitats, disturbance of wildlife associated with those sites is likely.

The strategies listed below will help the refuge achieve its objective of providing suitable open water and aquatic habitat with minimal disturbance to support and enhance the population viability of black ducks, bitterns, and other waterfowl species as well as protecting other wildlife species associated with aquatic habitats on the refuge.

Strategies:

Within 0-3 years of CCP approval:

- Survey stream and river segments to document locations of existing populations of brook trout and reddsides. We will focus on these areas for riparian corridor restoration.
- Identify riparian corridors and springs with less than 90 percent forest cover within a 100 meter and 500 meter buffer of the stream or spring. Prioritize locations for reestablishing forest within 100 meters of the stream and improving forest cover within 500 meters of the stream, with highest priority given to stream reaches with less than 50 percent forest cover for greater than 100m along the stream.
- Identify effective management techniques for enhancing brook trout populations and develop a management plan for implementing the strategies. Strategies may include stocking native (local genotype) brook trout, removing brown trout from headwater tributaries and seeps, and in-stream habitat restoration.

Within 3-5 years of CCP approval:

- Begin riparian restoration to increase canopy cover and corridor width by planting native tree and tall shrub species, using local seed source when possible, and allowing the regeneration through natural succession of woody species.
- Evaluate need and feasibility of translocating reddsides from elsewhere in the State to suitable locations within the refuge, and if translocation is deemed feasible, establish timeline for reintroduction
- Implement cold water fisheries restoration plan.

Throughout the Life of the CCP

- Work with WVDNR and other partners to support inventories of cold water habitat to document persistence of native brook trout and reddsides.
- Use the framework provided in the Interagency Status Report on the Fisheries Resources of the Upper Blackwater River in West Virginia (Moss et al. 2007) to plan future management actions on stream and river habitats.
- Protect from disturbance isolated beaver ponds and river habitats that support nesting, feeding and roosting areas for migratory birds by allowing public access only from approved public use trails where they intersect stream or corridors or pond habitat.
- Allow the dynamic nature of beaver pond formation and evolution where bottomland forested and rare plant communities are not threatened.
- Inventory and monitor priority wildlife and plant species in this habitat type.
- Conduct acoustical monitoring to detect foraging locations of Indiana bats during breeding and migration seasons.
- Conduct priority wildlife monitoring activities to track wildlife population trends associated with aquatic resources.
- Work with partners and adjacent land owners to improve riparian cover within the Canaan Valley watershed.

Objective 1.5: (Research Natural Area)

Establish a Research Natural Area (RNA) to participate in the national effort to preserve examples of major wetland ecosystem types; to provide research and educational opportunities for scientists and others in the observation, study, and monitoring of the environment; and to contribute to the national effort to preserve a full range of genetic and behavioral diversity for native plants and animals.

Rationale

RNAs exist to fulfill three objectives, outlined in the Refuge Manual (8 RM 10) as follows: first, to participate in the national effort to preserve adequate examples of all major ecosystem types or other outstanding physical or biological phenomena; second, to provide research and educational opportunities for scientists and others in the observation, study, and monitoring of the environment; and third, to contribute to the national effort to preserve a full range of genetic and behavioral diversity for native plants and animals, including endangered or threatened species.

Federal land management agencies have developed a national system of RNAs since 1927. The RNA designation is an administrative designation to establish areas on which natural features and processes are preserved with minimal human intervention for research and education purposes. The established refuge policies

(8 RM 10) provide the only protection for these areas and there are no separate Federal regulations which apply.

In this management action we will designate a portion of the refuge's central wetland complex to be included in the Research Natural Areas system. The area under consideration is the core wetland complex and consists of several different distinct community types including palustrine marsh, beaver influenced wetlands, wetland shrub swamp and peatland. Although much of the wetland on the refuge falls into these general plant community categories, this central wetland area was chosen for nomination due to its size, contiguous habitat and the ability to delineate boundaries mostly based on natural features and topography. For the purposes of this discussion we will call this area the Blackwater Research Natural Area (BRNA).

The BRNA will consist of 754 acres and will be bounded generally by the western edge of the wetland complex along the Blackwater River to the south and west, Middle Ridge to the East and a portion of Glade Run to the north. It is approximately 97 percent wetland and 3 percent upland habitat. Plant communities within the BRNA include: 227 acres of herbaceous wetland, 470 acres of shrub wetland and 8 acres of open water/aquatic habitat. A limited number of upland habitat type acres are included in the BRNA for practical purposes. These acres are physically located within the larger wetland complex and they contribute to making the BRNA a more manageable unit.

Of the wetland types, the shrub wetland communities are broken out to include 277 acres of blueberry, 108 acres of St John's wort, four acres of speckled alder, 58 acres of viburnum, 23 acres of black chokeberry, and one acre of spirea tall shrub thicket. Most of the shrubland habitat exists as either narrow bands (alder) or scattered shrubs within a saturated moss-dominated or emergent wetland. Therefore the habitat suitability for hunted species such as American woodcock is low and the designation will have little effect on the hunter opportunity for game species.

RNAs may be categorized according to biological and physical features, management criteria and classification systems. The BRNA supports many of the qualifications for biological features. As a component of the largest wetland complex in the State of West Virginia as well as containing the largest contiguous peatland and shrub swamp plant communities, it meets the criteria of an ecological community that illustrates characteristics of a physiographic province or biome. The BRNA exhibits a prime example of high elevation/Central Appalachian wetland plant communities.

The cool, moist climate of the valley has maintained favorable growing conditions for northern plant species following the last glaciation. Balsam fir represents one of 109 plant species that have distinctly northern ranges but are able to persist in the valley. Twenty-three of these species and varieties have been reported from five or fewer locations in West Virginia. The area is mixed with northern-affiliated plant species as well as several species considered endemic to the Central Appalachians and some southern high elevation species reaching their northern-most extent. Botanists have recorded 73 State species of concern in Canaan Valley. Twenty-eight species are listed as critically imperiled (S1) by the WVDNR Natural Heritage Program. NatureServe and the network of Natural Heritage programs rank four species (Appalachian blue violet, glade spurge, Appalachian oak fern, and Jacob's ladder) as globally vulnerable (G3). These facts meet the biological criteria established for RNAs including allowing relic flora to persist from earlier periods, and a habitat which supports a vanishing, rare or restricted species.

Much of the area under consideration was subject to community altering disturbances from the late 1800s through the late 1990s. Logging, fires, grazing and unrestricted off-road vehicle use caused great impacts to the wetland complex of the planned BRNA. However, following refuge acquisition and protection, much of the wetland plant communities have begun the slow process of natural restoration and succession. Because of this area's disruptive past and subsequent protection, the BRNA meets the criteria for an ecological community significantly illustrating the process of succession and restoration.

The proposal to designate the BRNA is consistent with the establishing legislation for the Canaan Valley refuge, as detailed in the Emergency Wetland Protection Act (1986). Establishing the core wetland complex as an RNA will elevate the significance of the area for research and educational opportunities supported by the refuge and identified in founding documents (USFWS 1979, USFWS 1994a). The establishment of the BRNA will help fulfill a stated purpose of the refuge by "insuring the ecological integrity of Canaan Valley and the continued availability of its wetland, botanical, and wildlife resources to the citizens of the United States" (USFWS 1979). Additionally the Station Management Plan (USFWS 1994c) notes that "Canaan Valley is by far the largest of the relict boreal ecosystems found in the high elevations of the central and southern Appalachian Mountains...Canaan Valley presents an outstanding scientific opportunity by virtue of its size, diversity and central location for the establishment of a research/educational center for study of these unique ecosystems." The BRNA will be used to fulfill the development of wetland ecological integrity indices and serve as a reference area. It will be promoted widely to explore long term research and monitoring of climate change, wetland succession and other aspects of wetland ecology and biology. The establishment of the BRNA will help achieve the goals stated in these founding documents for the refuge.

Upon designation a site specific natural area management plan will be written for the BRNA, concurrent with the refuge HMP. The RNA plan will detail use objectives and restrictions, management objectives and maintenance details, and protection objectives and practices. Generally we expect the BRNA to meet all the objectives outlined in the Refuge Manual for protection, access, structures and management. There are possible hydrologic restoration actions which could occur within the planned BRNA, however these will require temporary actions aimed at preventing degradation of the wetland and will therefore not violate the objectives for management of RNAs.

The Refuge Manual states that a RNA "must be reasonably protected from any influence that could alter or disrupt the characteristic phenomena for which the area was established." Therefore, if predator removal or other disruption of the community processes has created conditions under which certain species multiply beyond normal limits and pose a disruptive threat, especially to vegetation, refuge management can include controlling these populations. For this reason we will continue to permit hunting for white-tailed deer and beaver trapping as population management tools. High deer densities have impacted natural regeneration, succession and likely distribution and abundance of plant species and communities in Canaan Valley. Allowing deer hunting within the BRNA will be required to fulfill the objectives for which the RNA will be established, in other words, to protect the wetland plant communities and provide exemplary opportunities for research and education. Allowing beaver trapping also fulfills the objectives for which the RNA will be established by protecting plant communities, especially the bottomland forest communities. Other consumptive and non-consumptive recreation will be restricted as is consistent with RNA guidance in the Service Refuge Manual (8RM10).

Strategies

In addition to strategies mentioned in Objective 1.1 (where appropriate relative to the management policy for RNAs)

Within 0-3 years of CCP approval:

- Complete a site specific management plan for the Blackwater Research Natural Area.
- Post boundaries as consistent with RNA policy (8RM10).

Throughout the Life of the CCP

- Conduct outreach to research agencies and institutions to develop an active program for wetland related research activities within the BRNA.
- Permit deer hunting as outlined in the refuge Hunt Plan and EA.
- Permit beaver trapping as outlined in the Furbearer Plan.
- Use the BRNA as a focal area in which to conduct monitoring for wetland ecological integrity.

GOAL 2

Perpetuate the ecological integrity of upland northern hardwood and northern hardwood-conifer forests to sustain native wildlife and plant communities, including species of conservation concern, for the development of late-successional forest characteristics, and to perpetuate the biological diversity and integrity of upland forest ecosystem.

Objective 2.1: (Northern Hardwood Forest)

Restore the 5,273 acres of northern hardwood forest to an unfragmented condition within and between refuge and adjacent lands (canopy cover greater than 80 percent, forest patches with a minimum distance of 600 m to non-forest edges, and maximum extent of forest acres) to maximize nesting and foraging habitat for forest interior migratory bird and other species of conservation concern. Benefiting species include scarlet tanager, black-throated blue warbler, worm-eating warbler, Eastern wood peewee, black bear, bobcat, and fisher.

Rationale

In this management action, we are proposing to maximize contiguous forest patches, with a target of greater than 7,400 acres. Important from a regional perspective; many migratory birds reach their abundance peaks in this region of the Central Appalachians. Managing and protecting contiguous forest will provide habitat for several species listed by the State as “species in the greatest need of conservation” including black-billed cuckoo, Cooper’s hawk and southern pygmy shrew (WVDNR 2006). Refuge forests provide breeding habitat for PIF Area 12 priority species such as scarlet tanager and Eastern wood pewee. Additionally many migrating birds which are also species of conservation concern in the Eastern and Northern Biomes utilize the refuge’s forested habitats. Examples include black-throated blue and Blackburnian warbler, both species of conservation concern in PIF BCR12 (part of the Northern Forest Biome) that comprised 17 percent of all landbird captures between 1958 and 2006 at the Allegheny Front Migration Observatory; five miles east of the refuge boundary (Rich, T.D. et al. 2004, Bell, R.K. 2006).

A block of forest at least 7,400 acres increases the probability of occurrence for several area-sensitive species and provides for the most sensitive species such as the black-throated blue warbler and scarlet tanager (Robbins et al. 1989; Betts et al. 2006). Reducing edge effects will improve and increase area-sensitive bird nesting habitat in refuge upland forests. Predation of bird nests decreases with



Steve Maslowski/USFWS

Scarlet tanager

increasing distance from the forest edge and has been documented to reach a minimum occurrence at 600 meters or greater from a forest edge (Wilcove 1985, Noss and Cooperrider 1994). As a surrogate for the distance from the edge at which forest interior is no longer affected by forest edge, forest patches will be maintained with a minimum radius of 600 meters to ensure high quality forest interior habitat. For this reason the refuge will strive to reduce fragmentation and prevent edge effects within a 600 meter radius of forest blocks.

The refuge will manage 5,273 acres of the current 6,400 acres of northern hardwood forest for area sensitive species. While this is less than the minimum target patch size for these species, approximately one-third of this forest is contiguous with forested

areas of public and private lands and therefore contributes to this goal with the surrounding forest at a landscape scale. Future acquisitions have the potential to bring refuge forest ownership to the 7,400 acre target.

Achieving the minimum target patch size requires working with adjacent landowners and converting some early successional habitats to forest cover. Areas of early successional habitat that currently fragment forested habitat will be the focus for habitat conversion and will be detailed in the Habitat Management Plan. Partnerships to manage adjoining forest patches as contiguous forest with the refuge will increase the effective size of the upland forest in the Canaan Valley area. Continuity with adjacent forested habitat is important to allow movement corridors between other forested landscapes, particularly for area sensitive forest birds and far ranging mammal species. Larger forest blocks on a landscape level will help create resistance and resiliency to possible effects of climate change allowing the refuge to play a larger role in forest conservation in West Virginia.

Refuge forest habitat will be managed to maintain and improve existing forest habitat to attain the largest acreage forest patch while attempting to minimize the perimeter to area ratio and reduce irregularly shaped forest patches. Focusing on enlarging narrow forest segments and connecting core areas can increase population sizes of interior forest species and reduce the populations of edge species, which includes invasive species, in the core habitat area (Ewers and Didham 2007). Maintaining and improving the quality of forested habitat and reducing forest fragmentation on refuge property will aid in the conservation of wildlife tied to this habitat on adjacent lands and provide a link between forests on Cabin, Canaan, and Brown mountains to valley habitats in lower elevations.

Logging of large tracts just prior to refuge acquisition in 2002 left sparse, and in some cases, less than 20 percent forest canopy cover (USFWS 2006a). This canopy cover is deficient when compared with old growth northern hardwood and beech-maple-basswood forests which ranges in cover from 75 to 97 percent (Tyrrell et al. 1998). Ensuring that the refuge forest cover is at least 70-80 percent provides continuity of habitat for interior forest-dependent species (DeGraaf et al. 1992). The past logging activities have also created a forest fragmented by

logging roads and clearings (former pastures). Many studies have documented the biotic and abiotic changes relative to forest removal and edge creation within forested habitats (Davies-Colley et al. 2000, Marsh and Beckman 2004, Franklin and Forman 1987). Due to the large number of existing logging roads and recently logged forest on refuge lands, these biotic and abiotic effects could be negatively impacting a variety of terrestrial wildlife species, including amphibian populations.

Old logging roads and clearings create narrow corridors of forest fragmentation throughout the core areas of refuge forested habitat, increasing the likelihood of incursion by non-native species into the forest and impacting breeding habitat for forest interior migratory birds (Watkins et al. 2003). Fragmentation as a result of road construction can decrease soil moisture and humidity, increase average soil temperatures and increase wind penetration as well as affect the predation and competition rates among forest dwelling species (Marsh and Beckman 2004). Salamander species such as red backed salamanders are known to be tolerant of disturbance and less sensitive to landscape scale disturbances such as logging road fragmentation (Gibbs 1998).

Logging roads may also affect the predator density within a forested ecosystem. Current research is being conducted to evaluate the effect logging roads have on predators (snakes) in areas adjacent to occupied Cheat Mountain salamander habitat. Preliminary results from the refuge found no live snakes on Powderline ski trail (an old logging road) as compared to 69 at a Dolly Sods study site and 31 at a Timberline resort study site (Bradshaw 2010). Results and recommendations from this study will be used to guide refuge decisions on management options for logging roads and trails on refuge land.

Restoration of old roads and skid trails will help reduce edge effects throughout the refuge's upland forested habitat. Allowing old roads to regrow or actively restoring roads and clearings on the refuge can help prevent the spread of exotic plants to the interior forested landscape, reduce erosion, and protect aquatic resources (Watkins et al. 2003, Switalski et al. 2004). Improving continuity of habitat and reducing potential of invasive species spread will improve the biological integrity of this habitat. The refuge's northern hardwood forest also serves as an important connection to the high elevation wetlands and headwater tributaries of the valley, and harbors unique forested seep communities.

Strategies:

Within 0-3 years of CCP approval:

- Identify and map forest patch sizes (inclusive of adjacent public and protected lands); locations of fragmentation including logging roads; percent canopy cover; and locations with less than a 600-meter radius, and prioritize locations for restoration.
- Identify local seedling source, and if needed, propagate local genotypes of forest species, to provide sufficient stock for replanting forest gaps.
- Identify and map logging roads where natural forest regeneration is being suppressed by exotic vegetation, soil compaction or other reasons.

Within 5-10 years of CCP approval:

- Plant tree seedlings to reduce the number of fragmented forest gaps by 50 percent.
- Obliterate, re-contour, and revegetate old logging roads identified as high priority sites for restoration.

Within 10-15 years of CCP approval:

- Conduct restoration actions to encourage forested habitat regeneration, which will reduce logging road fragmentation. Methods include but are not limited to planting logging roads with native tree and shrub species and road obliteration/re-contouring with heavy equipment.

Throughout the Life of the CCP:

- Work with partners to evaluate management options for promoting mature forest characteristics, forest species diversity, and understory development.
- Conduct breeding bird surveys in forest communities to monitor trends especially for birds of conservation concern.
- Protect the core spruce-dominated forests from disturbance, fragmentation, or invasive species infestation.
- Work with partners to experiment with methods to achieve late-successional characteristics.
- Allow forest succession to proceed to reforest recently logged areas such as Middle Ridge by reducing deer browse pressure and by planting with spruce and hardwood seedlings.
- Conduct priority wildlife monitoring activities to track changes in focal species and WVCAP priorities over time as a result of management actions.

Objective 2.2: (Northern Hardwood Forest Understory)

Restore structural and compositional diversity in the hardwood forest understory and mid-story (1-12 cm dbh size class) to provide nesting and foraging habitat for species of conservation concern such as black-throated blue and Canada warblers and maximize the persistence of herbaceous plant populations such as glade spurge and forest seep communities. Target structure and composition includes increasing the mid-story stem density, mid-story diversity index, and cover and diversity of herbaceous species.

Rationale

Recent forest inventory data (USFWS 2006) reveal a paucity of seedling and sapling-aged trees and shrub vegetation in the refuge's northern hardwood forest understory. Diversity of shade-tolerant tree species in the understory was lower than that of the canopy. Lack of regeneration and subsequent understory forest structure and diversity means a diminished quality of habitat for migratory birds dependent on midstory structure for breeding, a forest less resilient to stochastic and catastrophic events, and reduced capacity to sustain itself over time. Many long distance migratory birds appear to rely more heavily on well developed, multi-layered forests than resident and short-distance migrants (DeGraaf et al. 1998). In Canaan, the lack of midstory woody species is likely due to intense browse pressure of white-tailed deer leading to the wide-spread growth of New York and hay-scented ferns. This interaction has been found in other northern hardwood forests. In Allegheny northern hardwoods, Horsley and Marquis (1983) found dense hay-scented fern cover prevented the establishment of most woody species. Species such as Rubus and yellow birch, which could penetrate the fern cover, were browsed by deer. In locations where Rubus was able to become established, fern cover decreased.

Many declining forest bird species in BCR 28 are reliant upon forest habitat with dense understory development, historically caused by local disturbances. However, excessive deer browse and a lack of forest management have reduced the abundance of this important forest understory structure throughout the BCR

(Rich, T.D. et al. 2004). These conditions are prevalent on the refuge as a recent forest inventory documented in 2006 (USFWS 2006a). The Canada warbler, a species of conservation concern for BCR 28, often is found in mature forested habitat with tree gaps allowing for the development of localized understory shrub and sapling development. In West Virginia, this species was more prevalent in forested habitat where individual trees were cut simulating natural tree-throw (Maurer and Whitmore 1981). Abundant deer populations have been correlated with lower Canada warbler abundance indicating impacts of deer from the suppression and removal of forest understory vegetation (DeGraaf et. al 1991). Improved forest structure will also benefit other understory dependent migratory birds such as ovenbird, worm-eating warbler, black-throated blue warbler and mourning warbler.

Selective low-volume logging that mimics natural disturbances of a mature forest in approximately half acre patches has been associated with lower predation rates on successional and understory dependent species like indigo buntings. These temporary and scattered gaps create “edge” habitat in small patches that may not support large numbers or regular use of mammalian predators (Suarez et al. 1997). Additionally creating small tree gaps in forested habitat provides improved structure and food resources important for a variety of migratory birds (Noss and Cooperrider 1994, Rotenberry et al. 1995). Species of conservation concern reliant upon this type of habitat in BCR 28 include black-throated blue warbler, Canada warbler, Eastern wood peewee and worm-eating warbler. Other wildlife requiring understory seedling and sapling development such as small mammals and woodland salamanders will also benefit. Ensuring deer browse does not significantly impact woody species regeneration is essential in the development of this understory habitat type.

Maintaining ecosystem functioning and natural processes includes managing for the diversity of understory flora. Herbaceous plants are indicators of forest health and condition (Keddy and Drummond 1996). High levels of browse over long periods of time from white-tailed deer is linked to local extirpation of forb species (Jenkins et al. 2007; Carson, et al. 2005; Augustine and Frelich 1998). Deer

browse of native plants may also be linked to increased invasive plant presence, particularly garlic mustard, in otherwise diverse ecosystems. When combined with canopy impacting invasive forest pests such as hemlock wooly adelgid, deer were found to exacerbate the problem of invasive species in forested communities (Eschtruth and Battles 2009).

Reducing browse pressure on browse-sensitive herbaceous plants will allow their persistence and perpetuate the natural diversity of flora as a component of an integral forest ecosystem. Glade spurge (S2G3) and the eastern rough sedge–wavy leaf moss sloping forested seep communities (S3G3) occur in the refuge’s northern hardwood forests and are considered vulnerable to extirpation, by the WVDNR and NatureServe. The persistence of these globally vulnerable conservation targets will benefit from the reduction of browse pressure.



Ken Sturm/USFWS

Fritillary butterfly on butterfly weed

Exotic forest pests such as beech bark disease, maple anthracnose, Asian longhorn beetle, woolly adelgids, and emerald ash borer threaten the health of the refuge's northern hardwood forests. Public education and outreach on the threats exotic pests pose to the forest and the role people play in bringing the pests to the area will assist in preventing or diminishing the introduction of new pests. Management responses to control exotic pests vary by species and adapt to the current scientific understanding of the species. As threats appear, investigating the latest, best management practices will ensure the most appropriate response.

Strategies

Within 0-3 years of CCP approval:

- Identify and map forest stands with high woody species diversity of seedlings and low midstory density. Target these areas for increased deer harvest and/or exclosures.
- Locate forest seep communities and glade spurge populations and develop monitoring protocols to indicate the communities' and species' persistence.
- Develop and implement a monitoring plan for presence of forest pests and respond to the threats as practicable with the best current management strategies available.

Within 3-5 years of CCP approval:

- Develop a flexible outreach and education program to reduce potential threats of forest pests and limit visitor use as necessary to prevent the spread of these pests.
- Establish and monitor five deer exclosures with controls to increase woody species recruitment, to act as refugia for browse-sensitive herbaceous and woody species, and to demonstrate the severity of deer browse pressure on the forest ecosystem in Canaan.

Within 5-10 years of CCP approval:

- Monitor stem density and species richness of understory development management areas to determine effects of deer browse on regeneration.

Within 10-15 years of CCP approval:

- Improve habitat structure for refuge focal species through thinning and/or other stand improvement operations. Methods include, but are not limited to girdling operations, single tree or group selection cuts of up to one-half acre in size with cutting cycles of 15 to 20 years in order to maintain understory development.
- Identify and prioritize even-aged stands for single tree fall disturbance to increase age class diversity.

Throughout the Life of the CCP

- Work with partners (State, Federal, and private communities) to manage deer densities on the refuge and surrounding lands in Canaan Valley that are compatible with objectives of understory woody and herbaceous forest development and protection.

Objective 2.3: Mature Northern Hardwood Forest

Restore late-successional forest characteristics in the northern hardwood forest to improve habitat for the threatened Cheat Mountain salamander, the West Virginia northern flying squirrel, and other amphibian, mammal, and migratory bird species of conservation concern. Target characteristics include increasing density of snags, increasing downed coarse woody debris, and increasing the density of large trees (>50cm dbh).

Rationale

Mature, late-successional forest in West Virginia and in the High Allegheny Plateau is scarce. Although 78 percent of the State is forested, currently less than 1 percent occurs in stands 90 years old or greater (USFS 2006). Historical accounts indicate that most of the trees in Canaan Valley were cut. Mature forest stands, uncut and greater than 200 years old, are absent from the valley. Periodic harvesting within the valley focused on removing black cherry and maples. The resulting forest communities are young and deficient both in species and forest structure diversity.

Late-successional forests, those forests 100-200 years old and regenerating after cutting or disturbance, are ecologically significant as reservoirs of biodiversity and habitat for late-successional dependent species. Diverse, healthy, and naturally resilient forests are an important component of a sustainable ecological system and provide habitat for a variety of species dependent upon mature forest characteristics. This forest sere is the link in the continuum from early successional habitat following disturbance and old-growth conditions.

Late-successional forests are characterized by large trees and snags, abundant coarse woody debris, a deep organic soil layer, and specific lichen and moss species living on dead wood (Whitman and Hagan 2004). Species dependent on these characteristics tend to be non-charismatic, such as mosses, lichens, fungi, and insects (Hagan and Whitman 2004). Providing habitat for these species maintains biodiversity that is likely to have implications for the ecological integrity of the forest system, even if those implications are currently unknown.

The refuge is imbedded in a forested area. The surrounding public and privately owned forests are not intentionally managed for late-successional stages. However, the recent Monongahela National Forest Plan (USFS 2006) notes that future mature forest stands will become established in wilderness areas and other areas of special interest. Dolly Sods, a wilderness area managed by the Monongahela, borders the south-east corner of the refuge. By managing for late-successional northern hardwood forest, the refuge can contribute to the development of late-successional characteristics over a larger landscape in



David Seals

Northern hardwood forest

the Allegheny highlands. This objective contributes to the biological integrity, diversity, and environmental health of the landscape surrounding the refuge, which complies with Service directives (601 FW3 3.7(c)).

Managing for late-successional forests also provides for the continuity of diversity and integrity of the area's forests. This continuity means that over centuries, the presence of large trees and coarse woody debris continues, regardless of local disturbances. Limiting manipulation of the northern hardwood forest to the simulation of natural disturbances (single tree fall gaps) and limiting early successional management to the edges of the forest ensures this continuity.

Improving late successional characteristics of forest stands will benefit focal species such as the threatened Cheat Mountain salamander and the recently delisted northern flying squirrel on the refuge. Increasing coarse woody debris and moving towards a more mature forest with a closed canopy will help improve micro-habitat conditions for the Cheat Mountain salamander as well as all terrestrial woodland salamander species. Increased coarse woody debris will also increase foraging opportunities for the northern flying squirrel through increased presence of fungal (truffle) growth. Larger trees with more interconnected branches, snag formation, and promotion of spruce regeneration will improve general habitat conditions for the West Virginia northern flying squirrel. Migratory birds of concern such as saw-whet owl and brown creeper will benefit from increased cavity availability and sloughing bark for nesting opportunities.

The 15 year scope of our CCP falls far short of the decades used to measure tree growth and stand development in the mixed forest. This objective requires consideration of a much longer timeframe within which to measure and achieve results. As such, our expectation is that it will take at least 100 years to accomplish this objective given the current state of refuge forested habitat. This timeframe is based on our prediction of how long it will take to achieve the forest and stand composition and structural characteristics targeted for our refuge focal species identified in the objective statement.

Strategies:

Within 0-3 years of CCP approval:

- Survey for Indiana bat presence and habitat use using mist nets and acoustic monitoring equipment in upland forested habitats, particularly near potential roosting areas, and determine appropriate conservation and management actions.
- Determine summer roosting and foraging locations in Canaan Valley using radio telemetry of Indiana bats captured in mist nets.

Within 5-10 years of CCP approval:

- Identify and map stands with late-successional characteristics by compiling regionally appropriate indicator characteristics (e.g. presence of certain moss and lichen species, number of snags per hectare, and number of trees > 50 cm dbh per hectare) and surveying stands for presence of these indicators.

Within 10-15 years of CCP approval:

- Improve habitat structure for refuge focal species through thinning and/or other stand improvement operations. Methods include, but are not limited to, girdling operations, reserve shelterwood cuts, or single tree or group selection cuts of up to one-half acre in size with cutting cycles of 15 to 20 years in order to maintain understory development. Retain approximately 6 snags > 15cm dbh per acre.

- Identify and prioritize even-aged stands for single tree fall disturbance and other silvicultural treatments to increase age class diversity.
- Develop monitoring metrics for inclusion into the HMP such as percent coarse woody debris, number of snags and measures of micro-topography and structural complexity.

Throughout the Life of the CCP

- Monitor breeding bird response to management.
- Conduct monitoring surveys for Cheat Mountain salamander and northern flying squirrels associated with this habitat.

**Objective 2.4 (Mature
Conifer Spruce / Mixed
Forest)**

Advance late-successional characteristics in 214 acres of coniferous and mixed coniferous forests to maximize breeding and foraging habitat for Blackburnian warbler, black-throated blue warbler, saw-whet owl, West Virginia northern flying squirrel, Cheat Mountain salamander, fisher, and other wildlife species of special concern. Target characteristics include increasing density of large diameter spruce trees and snags, conifer canopy cover, cover of coarse woody debris, and increasing mid-story stem density (1-12 cm dbh size class). We will strive to achieve 60 percent occupancy by Blackburnian warblers in all spruce-dominated forests larger than 2.5 acres and increase occupancy by black-throated blue warblers by 10 percent over the next 15 years.

Rationale

Historical documents from the Canaan Valley area recall a time when a vast spruce forest covered the high Allegheny plateau, including the wetlands and uplands of the valley. The refuge currently protects approximately 32 acres of upland red spruce forest and 182 acres of mixed spruce-hardwood forest. Most of these stands occur on the high elevation ridges of Cabin Mountain. Red spruce forest classification was recently completed in the State and integrated into NatureServe. Rankings developed for the upland spruce communities on the refuge indicate they are either imperiled or vulnerable at both the State and global levels.

The red spruce forests of the refuge and the high Allegheny plateau harbor a unique, boreal assemblage of flora and fauna. Fisher, saw-whet owl, the recently de-listed West Virginia northern flying squirrel, and the Federally threatened Cheat Mountain salamander occur in the high elevation spruce forests. These and other species of the spruce forests find optimal habitat where late-successional characteristics are prevalent. The NNL designation (1974) and the refuge's 1979 EIS recognized the importance of protecting this unique, relict boreal ecosystem.

Maintaining the integrity and restoring the pre-settlement character of the spruce forests where practicable are mandated in the Service's Biological Integrity, Diversity, and Environmental Health Policy (601 FW 3) and continue to be relevant. By managing the existing red spruce forest for late-successional characteristics, 20 species identified in the WVDNR's Wildlife Conservation Action Plan (2006) as in greatest need of conservation concern in the State will benefit. PIF identified Blackburnian and black-throated blue warblers as priority species of management concern in BCR 28, and as species of high regional concern within Physiographic Area 12. Due to the disjunctive distribution of mixed spruce habitats within Area 12, existing habitat is considered a very high conservation concern (PIF 2003). Blackburnian warblers are experiencing a 3.8 percent decline per year within Physiographic Area 12 and even a steeper decline (9.0 percent decline per year) within West Virginia. Although range-wide trends for this

species are positive (0.8 percent per year), most studies indicate that the Canadian populations are responsible for this increase (Morse 1994).

Breeding habitat and seasonal territory for Blackburnian warbler has been found to average about 1.1 hectares (~2.7 acres) in forests similar to Canaan Valley: largely deciduous with patchily distributed conifers (Sherry and Homes 1985). Where spruce cover is denser, territories were smaller, typically between 0.4 and 0.6 hectares (~1 to 1.5 acres) in size. For this reason, we are using a minimum patch size of 2.5 acres as a management target for increasing the size of existing spruce cover for accommodating the assumed minimum territory for breeding Blackburnian warblers on refuge lands.

Black-throated blue warbler populations are considered stable within Physiographic Area 12. This species has a relatively small range and low densities even in suitable habitat. It requires dense understory structure for nesting which is generally poorly developed on the refuge due to heavy deer browse and fern encroachment following logging activities. This species is sensitive to structure and forest types which are restricted on the refuge and the central and southern Appalachians.

Increasing large spruce and snag density and coarse woody debris cover will ensure persistence and future expansion of existing Cheat Mountain salamander and West Virginia northern flying squirrel populations on refuge lands. The refuge's even-aged stands provide a different structure in the forest than the former uneven-aged stands. Applying silvicultural techniques to increase the late-successional characteristics of the spruce forests can restore structural diversity of the stands and provide higher quality habitat for these species (Rentch et al. 2007, Carey and Wilson 2001). The refuge entered into an MOU with partner agencies and organizations in 2006 which focuses efforts on the protection and enhancement of spruce habitat and late-successional characteristics.

Red spruce forests on the refuge and in the high Allegheny plateau are geographically and environmentally restricted and their former extent has been reduced to more or less isolated, small patches by logging and the regeneration of northern hardwoods replacing the spruce stands. This scarcity of habitat increases the risk posed by environmental threats to the ecosystem. Improving the quality of the existing spruce stands will provide increased resiliency to the threats facing these high elevation forests on the refuge.

Strategies:

Within 0-3 years of CCP approval:

- Identify all forest stands greater than 2.5 acres where red spruce is dominant. These stands will become the baseline breeding habitat locations for focal migratory bird species.
- Develop and implement a forest understory habitat management plan for existing spruce forests which encourages shrub and sapling understory growth across large tracts of spruce dominated forest, retaining coarse woody debris and minimal removal of overstory cover.

Within 3-5 years of CCP approval:

- Improve habitat structure for refuge focal species through thinning and/or other stand improvement operations. Methods will include, but are not limited to, girdling operations, single tree or group selection cuts of up to one-half acre in size with cutting cycles of 15 to 20 years, and reserved shelterwood cuts. All management locations will be inventoried for Cheat Mountain salamander presence prior to cutting. We will consult closely with the Service's West Virginia Field Office (WVFO) and comply with the Recovery Plan recommendations during planning of cutting operations.

Throughout the Life of the CCP

- Conduct landbird point counts in spruce dominated forests to monitor focal migratory bird species breeding densities and track changes relative to habitat management.
- Conduct monitoring for focal species and other species of conservation concern in relation to spruce management areas.
- Protect the core of the spruce-dominated forests from disturbance, fragmentation, or invasive species infestation.
- Conduct monitoring surveys for Cheat Mountain salamander and West Virginia northern flying squirrel associated with spruce habitat.
- Work with partners to experiment with methods to achieve late-successional characteristics.

Objective 2.5 (Conifer Spruce / Mixed Forest)

Expand the areal extent of understory and canopy spruce by at least 25 percent in conifer and hardwood dominant forests to increase the potential future spruce-dominated forest and habitat for high elevation, conifer-forest dependent species such as Blackburnian warbler, black-throated blue warbler, saw-whet owl, fisher, West Virginia northern flying squirrel, and Cheat Mountain salamander.

Rationale

Historical accounts of forest communities within and surrounding Canaan Valley indicate they were heavily dominated by conifers, mostly red spruce, prior to the late 1800s. Red spruce is a component of the relict montane forest community in West Virginia. Spruce forests of West Virginia are listed as an “endangered ecosystem” by the USGS (Noss, R. F. 2000). They have experienced 85-98 percent decline from their original range. In Canaan Valley, this plant community has been severely degraded and in many locations entirely removed from the landscape following extensive logging operations and fires. Originally thought to cover as much as 500,000 acres, with some estimates as high as 1 million acres, red spruce and spruce/hardwood forests now cover less than 50,000 acres in the State. The refuge will work to increase the extent and quality of red spruce forests in the existing locations and others provided by historical information and ecological modeling. The extent of spruce forest predicted over the next 15 years will be only a piece of the long term restoration vision of the refuge. The HMP will provide greater detail in locations of planting and silvicultural treatments to further this goal.

The spruce forest of the West Virginia highlands provides unique habitat for a variety of wildlife species typical of more northern areas such as fisher, snowshoe hare, saw whet owl, and northern goshawk. In its WVCAP, WVDNR identified red spruce forest as a habitat “at-risk” with high conservation value. The WVCAP also identified 20 species in “greatest need of conservation” found in this habitat. Additionally, the threatened Cheat Mountain salamander and the recently de-listed West Virginia northern flying squirrel are found in close association with spruce forests. The lack of suitable habitat including the red spruce forest and the degraded and isolated condition of existing spruce forest were the primary reasons for listing the Cheat Mountain salamander and the West Virginia northern flying squirrel under the ESA, although the squirrel has recovered and was recently delisted. Increasing spruce forest on refuge lands will help improve local northern flying squirrel populations on refuge land.

Current stands of red spruce on the refuge are highly fragmented and exist almost entirely on the ridge line of southern Cabin Mountain or in isolated

pockets of riparian corridors and bottomland forest swamps. Many existing spruce dominated stands are not large enough to provide significant habitat for migratory species of concern such as Blackburnian warbler. Additionally, refuge stands are generally isolated patches without corridors or connectivity with other stands within the refuge or to neighboring forestlands.

Improving the size and connectivity of red spruce forest on the refuge will help long term management and protection of species with the highest need for conservation in the State and within the flyway. Surveys by refuge staff have documented populations of the threatened Cheat Mountain salamander which are apparently isolated from each other due to the changes in forest community and loss of spruce dominated forest stands. Connectivity between refuge and USFS red spruce forest will be important for the stability of the recently de-listed West Virginia northern flying squirrel on refuge lands.

This objective is consistent with the goals of the multi-agency MOU for the conservation of the red spruce–northern hardwood ecosystem established in 2006. The MOU emphasizes the need for land management agencies and other organizations to work towards the protection and restoration of the historic red spruce ecosystem in the Allegheny Highlands. Signatory agencies have begun a collaborative working group focused on red spruce restoration within the Allegheny highlands and identified the importance of spruce restoration within the Canaan area. Canaan offers a large expanse of potential wetland spruce forest habitat which is otherwise lacking throughout West Virginia. Modeling efforts indicate that most of the wetland habitat within Canaan Valley is consistent with requirements for red spruce forests and is a candidate area for restoration.

Achieving the desired conditions detailed in this objective requires more than the 15 year planning window of this document. Nonetheless, strategic habitat management and planning efforts must be begun now and throughout the course of this 15 year plan in order to set the foundation for conifer restoration efforts on this refuge. We do not expect to meet all species and habitat objectives within the time frame of this plan but will work towards these objectives through active restoration and planning efforts within the refuge and between the refuge and its partners.

The refuge has been an active member in the Central Appalachian Spruce Restoration Initiative (CASRI) a collaborative working group for the restoration and conservation of the red spruce-northern hardwood forest ecosystem. This group includes the U.S. Department of the Interior, Fish and Wildlife Service (West Virginia Field Office and Canaan Valley National Wildlife Refuge); U.S. Department of Agriculture Forest Service (Monongahela National Forest and Northern Research Station); State of West Virginia (Division of Natural Resources and Division of Forestry); The Nature Conservancy, and the West Virginia Highlands Conservancy, among others.

CASRI has been practicing Strategic Habitat Conservation (SHC) in West Virginia since its inception in 2007. Utilizing the scientific expertise of several State and Federal agencies along with capabilities provided by NGO's, universities and private organizations we have been able to apply specific resource goals over broad political and geographic boundaries. The recent increase of SHC collaborative work by the Service has reinforced the CASRI's activities and could help expand and coalesce efforts as part of a Landscape Conservation Cooperative within the Appalachian Geographic Area.

(See rationale for Objective 2.4 for further discussion on this topic.)

Strategies:

Within 3-5 years of CCP approval:

- Identify and prioritize areas with greatest potential for spruce regeneration with emphasis given to suitable soils and aspect, proximity to existing spruce stands and riparian areas, and gaps and fragmentation created by old logging roads.
- Locate and monitor Cheat Mountain salamander populations and use this information to help understand the impediments to the viability of the populations.

Within 5-10 years of CCP approval:

- Work with partners to experiment with silvicultural techniques that will increase long-term canopy dominance of red spruce.

Within 10-15 years of CCP approval:

- Improve Cheat Mountain salamander habitat to increase the population's viability.

Throughout the Life of the CCP:

- Work with partners to maintain and perpetuate a source of red spruce seedlings available for planting on the refuge.
- Plant spruce seedlings in high priority areas for regeneration in at least 20 acres a year.
- Collaborate with land management agencies and adjacent land owners to increase connectivity of spruce stands across management boundaries.
- Identify, connect, and enlarge spruce stands by under-planting existing vegetation with spruce seedlings.

GOAL 3

Provide and promote through active management a diversity of successional habitats in upland and wetland-edge shrubland, old field, grassland and hardwood communities to sustain early successional and shrubland specialists such as golden-winged warbler, American woodcock, brown thrasher, Eastern towhee, field sparrow, and other species of concern.

Objective 3.1 (Forested Wetland–Aspen Woodlands)

Manage 114 acres of successional aspen communities on a 15-20 year rotational basis so that 75 percent is continually maintained in early successional stages (0-15 year class) with a high stem density and less than 60 percent herbaceous ground cover, to perpetuate and potentially expand and improve aspen habitat for golden-winged warbler, American woodcock, brown thrasher, Eastern towhee, and other priority migratory bird species.

Rationale

Quaking aspen is an important habitat type for a variety of migratory and resident birds. Young dense regenerating stands are important foraging sites for woodcock and other song birds. Older stands provide suitable nesting habitat (Sepik et al. 1981). In Canaan Valley, aspen communities were found to have one of the greatest avian species diversity of all habitats studied. Between 1978 and 1993 a total of 33 species were documented during the breeding season using aspen stands in Canaan Valley (Michael 1993, Michael 1992a). Successional habitat created by aspen management may be particularly effective in Canaan where deer browse pressure is high. Aspen root suckers may outgrow deer herbivory pressure in one season thereby making it an effective community type to manage for early successional habitat.

The decline of early successional and transitional forest habitat in the northeast is concurrent with the decline of species dependent on this habitat type (Sauer et al. 2007, Fink et al. 2006). On a regional scale, loss of small farms, commercial and residential development, suppression of historically important disturbances such



Aspen wetland

as fire, and decrease in large area clear-cutting contribute to the loss of early successional habitat (Brooks 2003, Lorimer 2001, Trani et al. 2001). The suite of birds reliant on this habitat type are of high conservation priority in BCR 28 and the State (PIF 2003, WVDNR 2006) and includes American woodcock, Eastern towhee, field sparrow, indigo bunting, and brown thrasher.

The refuge's extensive shrublands, old fields, and young forests currently provide early successional and shrubland habitat that is scarce in the region, State, and local area. Managing for early successional and shrubland habitats on the refuge will ensure the persistence and protection of this habitat, unavailable in the surrounding landscape (Dettmers personal communication 2007, Smith et al. 2007). This may be particularly significant relative to the local extent of available managed early successional and shrubland habitat. The refuge is surrounded by forested lands including the Monongahela National Forest (Dolly Sods Wilderness Area) and two State parks where early successional habitat management is not a priority.

One technique used to create and maintain early successional habitat in the northeast is cutting for the regeneration of aspen stands. When cut, girdled, or burned aspen vigorously root sprouts, creating a dense growth of sapling aspen stems. The resulting cover is preferred foraging ground for American woodcock, ruffed grouse, and a variety of nongame migratory birds. The HMP that will incorporate these disturbance techniques will be a priority to maintain a mosaic of regenerating aspen on the refuge and contribute to the available early successional and shrubland habitat.

Generally, aspen management will occur in a mosaic to ensure that multiple age classes prevail across the landscape. Management of aspen will focus on selective patch cutting so that within an aspen management area, multiple age classes of aspen are represented to provide the breadth of habitat requirements for a diversity of wildlife species (Gullion 1984). Aspen management will be primarily

performed with hand crews but may include the use of fire and heavy equipment such as a hydro-axe where appropriate. Management will focus on perpetuating and increasing aspen across the landscape with target patch sizes of 3 acres or greater. However, even small aspen stands have been shown to be important for a variety of neotropical migratory birds (Turchi T.M et al. 1995). Preferred aspen management to perpetuate the stand and provide abundant sprouting is to cut the entire stand, rather than selection or single tree cuts. (Gullion 1984).

Quaking aspen stands in Canaan Valley are a successional stage in the development of mixed conifer forested wetlands (Byers et al. 2007, E. Byers personal communication). These forested wetlands are of high conservation value as they occur in the State as an outlier population considerably south of this species' primary range (Byers et al. 2007). Preserving a portion of the aspen stands will allow the development of the late-successional stages of the wetland forests and decrease the opportunities for the invasion of non-native plant species.

Beaver are a natural force regenerating aspen in Canaan Valley. The beaver browse young and mature aspen stems, stimulating root sprouting and the creation of dense pockets of new aspen stems. When the beaver population is unchecked, however, their preference for aspen can deplete an aspen stand and prohibit the dense regeneration favored by early successional bird species. Beaver trapping will balance the important role beaver play in maintaining the mosaic of wetland communities including aspen stands (refer to Objective 1.2) with the interest in maintaining dense regenerating aspen stands. For more information on how the refuge will utilize beaver management to achieve habitat goals, refer to the compatibility determination for furbearer trapping (beaver) in appendix B.

American woodcock is a priority species of conservation concern and an important management species for recreational hunters. As a species occurring in Canaan Valley in greater concentration and abundance than other parts of the State, the refuge identifies woodcock as an important management species. The Service developed the *American Woodcock Management Plan* in 1996 to help stem the decline in American woodcock (USFWS 1996). In 2008 the American Woodcock Conservation Plan was distributed by the Woodcock Task Force and identified recent trends and made recommendations for conservation on a continental scale. Long-term trends show a statistically significant decline of 1.03 percent in the breeding population of woodcock from 1968-2009 and a 2.55 percent decline in West Virginia during the same time period (Cooper et al. 2009). Although the breeding index for woodcock in West Virginia has been positive showing numbers of singing males to be slightly higher than predicted values for the State, long term trends show a continued decrease in singing male woodcock (Kelley and Rau 2006). Recruitment rates (number of immature birds per adult female) for West Virginia in recent years were consistent with regional recruitment rates but on average still below the long-term regional average (1963-2007) (Kelley and Rau 2006). Changes in singing male populations in West Virginia show a deficit of 17,222 males compared to densities observed in the 1970s (Kelley and Williamson 2008). The major causes for these declines are thought to be loss and degradation of habitat on the breeding and wintering grounds, resulting from forest succession and land use changes (Dessecker and McAuley 2001, Dwyer et al. 1983, Owen et al. 1977, Straw et al. 1994).

The WVCAP identifies American woodcock as a Priority 1 species for conservation (WVDNR 2006) and the USFS Forest Plan lists it as a "vulnerable" species in the Monongahela National Forest (2006). Additionally, American woodcock has been noted as a priority for the Canaan Valley refuge in all of its founding documents (USFWS 1979, USFWS 1994a). Canaan Valley continues to support the largest documented fall migration habitat in West Virginia and

accounts for the largest percentage of woodcock harvest of any area in the State. Management of early successional habitat is necessary to maintain and improve habitat for this species for both nesting and migration habitat.

Woodcock require several different habitat conditions that must be in close proximity to one another. Functional foraging habitat for woodcock occurs on moist, rich soil dominated by dense shrub cover (75-90 percent). Young shade intolerant hardwoods and aspen create ideal habitat as feeding areas and daytime (diurnal) cover (Kelley and Williamson 2008). Other habitats include clearings for courtship (singing grounds), large openings for night roosting, and young second growth hardwoods (15-20 years) for nesting and brood-rearing (Kelley and Williamson 2008, Sepik et al. 1981; Keppie and Whiting 1994). Recommendations for the stabilization of early successional habitat are to focus on cutting mature forest types that are potentially suitable for woodcock habitat as well as allowing non-forested habitat to mature into habitat that will support woodcock (Kelley and Williamson 2008).

The refuge will work with partners such as the Wildlife Management Institute, universities, and the WVDNR to develop early successional habitat research and management demonstration areas that include a variety of early successional habitat types as described in Objectives 3.1, 3.2 and 3.3. The purpose will be to establish at least one site on the refuge which can demonstrate effective habitat management for priority early successional species of concern in BCR 28, such as American woodcock, Eastern towhee, and Canada warbler. Several areas are indicated on map 4-1 for potential demonstration sites where a mosaic of plant communities will be managed together to best meet the needs of priority early successional migratory birds. The refuge, in consultation with its partners, will establish at least one site for these purposes. If management capability permits, research needs develop, partner support is sufficient, and the action does not conflict with the objectives for older growth forest management elsewhere in this plan, other demonstration sites will be included under this management action. Management methods within demonstration areas may include forest cutting, mowing, grazing, and prescribed fire. Monitoring and research will be emphasized to communicate results of management to the public and other State and Federal agencies.

Strategies

Within 0-3 years of CCP approval:

- Develop and implement a HMP detailing aspen management for successional wildlife habitat with an emphasis on improving breeding and foraging habitat for American woodcock, golden-winged warbler, and other migratory birds.
- Develop or adapt (from others) monitoring protocol consistent with the furbearer management plan to assess beaver activity near regenerating aspen stands and continue to manage beaver populations adjacent to aspen management areas to prevent excessive damage.
- Work with partners to establish early successional management demonstration sites which include aspen communities.

Within 3 to 5 years of CCP approval:

- Identify and designate aspen stands where perpetuation of natural succession to forested swamps will occur. New vegetation mapping will be sought to identify new aspen stands on refuge land.

Throughout the Life of the CCP:

- Conduct landbird point counts and woodcock singing ground surveys to assess performance of managed aspen habitats for meeting fundamental objective (Objective 3.1) and to determine the need for future management actions.
- Manage aspen annually through block cutting to promote early successional habitat and to prevent the loss of aspen habitat through successional development within the management areas.

Objective 3.2 (Northern Hardwood Forest–Edge Habitat)

Use accepted silvicultural practices within 1,130 acres of forest edge areas to create openings, promote understory development, and develop and sustain breeding and foraging habitat for American woodcock, Eastern towhee, brown thrasher, Canada warbler, and other species of concern.

Rationale

Northern hardwood forests comprise approximately 6,400 acres on the refuge, occurring primarily on the slopes of Cabin, Brown, and Canaan mountains and along Middle Ridge. Shrubland and old field meadows typically surround the forest on the more gentle toe-slopes before transitioning to wetland communities. Pockets of northern hardwood forest, less than 8 acres, occur within the toe-slope shrublands and meadows. Together, these forested islands account for nearly 500 acres of forested habitat. However, with less than 100 m buffering their edge and interior, they function entirely as edge habitat and provide little benefit to forest interior species.

The refuge is identifying these pocket-forest areas and a 100 meter-wide band at the edge of the main body of the northern hardwood forest as suitable for reverting to early successional habitat. The 100 meter-wide band of northern hardwood forest identified as suitable for cutting will be limited to protect sensitive plant communities and habitat features. Riparian buffers greater than 100 meters on each side of water features will be maintained. Rare or sensitive plant communities will be avoided, including areas with limestone-influenced soils. The forest gap along Sand Run and upper Glade Run is excluded in order to maintain the connectivity between the forests of Middle Ridge and Cabin Mountain. Areas will be prioritized based on their proximity to suitable breeding, foraging, and migration habitats and to other early successional habitat management activities.

Converting the forest islands and edges to early successional habitat will provide additional nesting habitat for priority species of concern such as brown thrasher, Eastern towhee, and American woodcock, post fledging habitat for forest bird species, and important migration foraging and staging areas. Early successional habitat is important as most species, especially migratory birds, associated with this habitat type are declining in the northeast (Sauer et al. 2005, Fink et al. 2006, DeGraaf and Yamasaki 2003). Providing successional habitat may be especially important on the refuge as the surrounding landscape is predominantly forested.

With the plan to increase early successional habitat by cutting forest, there will be a loss in extent of overall forested habitat and a slight reduction in the extent of forest interior habitat. However, we expect there to be minimal loss in habitat quality. The forested islands provide poor habitat for both forest interior and early successional species. Cutting along the forest edge may improve foraging habitat for forest interior bird species. Forest interior birds utilize successional vegetation as post breeding habitat (Chandler 2007, Vitz and Rodewald 2006, Vitz and Rodewald 2007, Denmon 1998, Pagen et. al 2000). Increased vegetative structure provides cover for inexperienced immature forest birds and more abundant food resources (particularly berry producing shrubs). Small patches of early successional habitat are important to post-fledgling, forest interior species and these species tend to avoid forest edges. This may indicate the potential importance of management to maintain discreet patches of early successional



Ken Sturm/USFWS

Blueberries

habitat in close proximity to forest interior breeding habitat for these species (Vitz and Rodewald 2006). Birds using Canaan Valley's forest interior habitat may benefit from regenerating forest adjacent to intact mature forest habitat (Dawson, personal communication 2007).

Management practices to convert forest edge to functional early successional habitat may include group selection, clear cuts or patch cuts of up to 5-15 acres in size. Sepik (1981) recommended patch cuts of 4 acres for woodcock management. Depending on deer browse impacts, some cuts may need to be larger. Cutting cycles and rotations may follow standard practices or be experimental to determine successful practices for Canaan Valley. Cutting cycles for northeastern woodcock habitat management typically range from 8 to 15 years and rotations from 20 to 40 years depending on habitat conditions. Canaan's management is expected to fall within these ranges. Some 3-5 acre openings may be permanently maintained primarily by mowing and brush clearing using mechanized equipment.

Management of this habitat will occur in a shifting mosaic of patches across the refuge as we implement decisions to allow fields, shrub, and young forest to transition to forest. Creating a series of variable-sized cuts along the forested toe-slopes of the refuge will allow early successional birds access to these newly created habitat types from adjacent suitable habitat along the forest-field edge. Because of the adjacent occupied habitat, successional forest edge cutting will serve to increase and improve the already existing habitat and ensure a continued availability of this habitat over time. Spacing of smaller cuts (0.2 acres or less) may be clustered to maintain an adequate level of early successional habitat across the landscape. Creation of a mosaic of smaller scattered forest cuts may prevent excessive nest predation typically associated with larger and permanently maintained openings (Suarez et al. 1997).

Due to the potential for Indiana bat use of upland forests in close proximity to wetland and riparian corridors the refuge will inventory management areas for bats prior to management actions. We will consult with the Service WVFO closely prior to conducting these operations.

Landbird point counts in regenerating successional habitat will be used to evaluate success of management actions for the targeted migratory bird species and fulfilling our objective. However, meeting this objective will also depend upon the impact of deer browse on desired woody regeneration. Therefore we will also evaluate regeneration success of cut forested habitat to determine the impact of white-tailed deer browse and fern encroachment on species diversity and succession of woody species. Deer densities on the refuge appear to be reducing forest regeneration. Recent harvest information (2002-2004) indicates that deer densities on the refuge may range between 17 to 30 deer per square mile (USFWS unpublished data, Gary Foster personal communication 2006) and a recent forest inventory on the refuge documented a lack of seedling and sapling forest species. A deer density that permits the success of successional forest development will be imperative to achieve this objective.

If woody regeneration success is not achieved (target stem densities, species diversity) or desired occupancy of focal migratory bird species is not met, the refuge will revise the management strategies to achieve this objective. This could include working with the WVDNR to decrease deer densities on the refuge and adjacent lands, fencing, and changing the size and spacing of cut areas. Target stem densities of regenerating hardwoods in one study were documented for northern hardwood forests as ranging from 91 to 297 stems per acre from 1 to

five years following a cut (Martin and Hornbeck 1989). Stem density, regenerating species diversity, presence and abundance of invasive species, and habitat use by targeted focal species will be used to evaluate the success of this objective.

Refer to rationale under Objective 3.1 for additional information on the importance of early successional habitat and demonstration site development.

Strategies:

Within 0-3 years of CCP approval:

- Develop and implement a Habitat Management Plan dealing with successional forest management plan for transitional hardwood forest communities.
- Develop and implement a monitoring plan to evaluate regeneration success relative to deer browse impacts and fern encroachment.

Within 3 to 5 years of CCP approval:

- Work with partners to establish early successional management demonstration sites, as described in the rationale for Objective 3.1, which include even aged stand management of forest edges

Throughout the Life of the CCP:

- Conduct landbird point counts during breeding and survey areas during migration to assess performance of managed successional hardwood forests for meeting fundamental objective above and to determine need for further management (set-back maintenance, selective thinning-out of tall tree species).
- Manage northern hardwood forest edge habitat through cutting of 10-15 acre blocks on a 15-20 year rotation to create openings, promote understory development, and sustain early successional habitat for American woodcock, Eastern towhee and other early successional species. Areas will be surveyed prior to cutting for the presence of Indiana bats. The refuge will use partnerships when necessary and available to conduct edge cutting operations.

Objective 3.3 (Shrubland and Old Field)

Allow natural succession to occur in 2,482 acres of old fields, convert 216 acres of grasslands, and maintain 853 acres of shrub communities 2-10 feet tall, interspersed with herbaceous openings to improve habitat for high priority, shrub-dependent birds of conservation concern such as golden-winged warbler, American woodcock, Eastern towhee, brown thrasher, and field sparrow.

Rationale

Shrub-dependent species are a declining bird group due to loss of early successional habitat. The PIF Continental Plan specifically recommends the management and protection of shrub habitat to help reverse declines of priority bird species (Rich, T.D. et al. 2004). This habitat type is also given a high conservation priority in the PIF Physiographic Area 12 plan (PIF 2003). In particular the plan notes the importance of high elevation areas providing naturally occurring shrub communities to support some of the most imperiled migratory birds of this habitat group. Shrub and old field habitats are also important for migrating land birds and raptors many of which are species of conservation concern from the Northern Forest and Eastern Biomes (Rich, T.D. et al. 2004). Management actions even on smaller tracts for shrub habitat can be effective as shrub dependent birds are not typically sensitive to habitat patch size and many will use small patches of shrub habitat (Watts 2000).

Shrub habitat comprised of various shrub species, or a diverse mix of young trees, provides an abundance of insect food for breeding birds which need to consume large amounts of protein for reproduction and feeding young. Many shrub species bear fruit in the fall which help boost the fat reserves for migrating or over-

wintering birds. The structural density in this habitat type provides cover from predators and shelter from harsh weather. Shrubby, early successional patches in close proximity to interior forest breeding territories are important for survival of fledgling forest birds, which feed on the abundant food sources in relative safety from predators in the dense foliage.

Planting alder may increase the amount of manageable alder habitat for woodcock in locations where soils are not saturated. These non-saturated areas provide suitable habitat for large numbers of earthworms, which are an important food source for woodcock. Alder in Canaan Valley currently grows mainly along flood plains of larger streams such as the Blackwater, North Branch, Little Blackwater, and Glade Run. Soil saturation is usually high in these sites with periods of flooding seasonally. Wet saturated soils are considered to be less functional as foraging areas for woodcock because of the low density of earthworms and higher density of herbaceous understory vegetation (Sepik et al. 1981, Weik pers.



Richard Baetsen/USFWS

American woodcock

comm. 2006, Williamson 2008). Propagation and planting of alder in drier sites adjacent to breeding and cover sites, although labor intensive, is an option to provide higher quality foraging habitat in alder cover. The refuge currently has an agreement with NRCS to propagate alder for this purpose. Sites for cutting alder will be evaluated prior to cutting to assess soil saturation and occurrence of other resources of concern. Typically we expect to inventory alder communities to identify drier alder sites for management which will be cut by hand crews. Size of the cut will depend primarily on hydrology and locations of plant communities of concern.

Old field habitat occurs as abandoned pasture or hay fields typically interspersed with hawthorn, spirea, St. Johnswort and other shrubby species. Some areas on the refuge appear to be slowly reverting to more woody species while others appear to be in a long term early successional/old field state. Fortney notes a slow shift from grass dominated habitat to shrub and young forest stands in a comparison of Canaan Valley habitats between 1975 and 1997. Similarly, the rate of early transitional forest types apparently slowed during the same period

(Fortney 1997). Density of grasses and bracken ferns as well as distance from seed tree sources and extensive deer browse pressure may explain the long term maintenance of this community type in Canaan Valley (Fortney and Rentch 2003). Nonetheless, the persistence of this open habitat interspersed with hawthorn and shrub thickets provides important habitat for a variety of breeding and migratory birds including field sparrow and northern harrier.

American woodcock favor woody succession habitats on moist soils where worms are abundant and use the shrubby forest floor for nest sites. Because of the high moisture content, these areas tend to be composed of woody vegetation in either shrubs or young tree species or both. Woodcock also need more open, short-grass habitat for singing and display territory during the breeding season, so shrublands in close proximity to short grasslands are ideal. Eastern towhee and brown thrasher prefer drier shrubby habitats such as are typically found along forest and field edges where vegetative growth is more complex and offers a variety of fruits, nuts, and insects among the leaf litter. Field sparrows favor old field/forest edges where woody encroachment, tall forbs, and shrubs are well-represented in an otherwise open habitat, and where they can quickly flee for cover in the adjacent forest. This scenario is frequently found in landscapes containing a mosaic mix of field and forest or in regenerating cut-over areas. Allowing old fields to develop into shrubby successional habitat is recommended as a management technique by the Woodcock Task Force (Kelly and Williamson 2008).

Under this objective the refuge will consider the use of prescribed grazing within the research demonstration areas to reduce herbaceous and woody vegetation, particularly under hawthorn savannah habitats. Dense hawthorns are important foraging areas for woodcock and are difficult to maintain utilizing mechanized equipment. Animals used for this purpose will be carefully managed to ensure stocking and duration meet habitat management goals of vegetation control. Once these goals are met, animals will be removed from the area. Should the refuge decide to use prescribed grazing, we will use the early successional demonstration areas as the evaluation site and we will develop a monitoring plan for vegetation response (both native and invasive species) as well as for wildlife response for targeted focal species. Before we employ prescribed grazing as a management tool we will need to write a compatibility determination for this use to ensure that grazing will not interfere or detract from the purposes for which the refuge was established or the mission of the Service.

Protection and management of these habitats will provide benefits to a diversity of other migratory birds and State species of concern. Both alder flycatcher and swamp sparrow are State species of concern that heavily utilize the shrub thicket habitats on the refuge. Invertebrate species of concern such as Atlantis fritillary and Harris' checkerspot utilize flowering plants in old field habitats for nectar sources such as ox-eye daisy, hawkweeds, milkweeds, and spirea (Allen 1997). Maintaining these shrub and old field communities will ensure that the refuge not only supports migratory bird species of concern on a regional context but also maintains local populations of State species of concern.

Refer to rationale under Objective 3.1 for importance of early successional habitat and demonstration site development.

Strategies:

Within 0-3 years of CCP approval:

- Develop and implement a shrub and old field habitat management plan as part of the overall HMP.

- Establish at least one demonstration area, easily accessible and visible from public access roads or trails, to demonstrate early successional management techniques and wildlife habitat response, as described in the rationale for Objective 3.1.
- Allow succession to occur on 216 acres of managed grassland and 2,482 acres of old field habitat to maintain and increase shrubland habitat.
- Identify and prioritize suitable locations for alder planting, conduct experimental plantings and monitor results.
- Identify locations where alder communities occur in unsaturated and drier soils, and prioritize and conduct experimental cutting for alder regeneration. Alder rotations will be approximately 20 years.

Throughout the Life of the CCP:

- Conduct landbird point counts during breeding, migration, or winter to assess performance of managed shrub and old field habitats for meeting the fundamental objective above and to determine the need for further management (set-back maintenance, selective thinning-out of tall tree species).
- Set-back succession by mowing or grazing 5-10 acre blocks of spirea, St. Johnswort and other fast growing shrub communities on a two to four year rotation to maintain singing ground habitat for American woodcock. Increased emphasis on shrub mowing will be in locations adjacent to other woodcock management areas or to accelerate habitat suitability of early successional bird habitat where it has been lost through successional development.

Objective 3.4 (Managed Grasslands)

Manage 315 acres of grassland habitat in fields no less than 50 acres by maintaining suitable herbaceous ground cover, bare ground coverage, vegetation height, grass-forb ratios and limiting invasive plant establishment to maximize breeding and migration habitat for grasshopper sparrow, Henslow's sparrow, bobolink, and other priority grassland dependent birds.

Rationale

Birds depending on early successional habitats such as grasslands are one of the fastest declining bird groups because of habitat loss and changes in farming practices. Grasshopper sparrows, for example, have declined at a rate of 3.6 percent per year across the U.S. from 1966 to 1994 and declined 5.4 percent per year in the northeast between 1966 and 2007 (Sauer et al. 1995, Sauer et al. 2007). Habitat loss, conversion of pasture to intensive row crops, increased frequency of mowing, and lack of fire are cited as the causes of population declines of this and other grassland-dependent species (Vickery 1996). Development and fragmentation of grasslands has continued in Canaan Valley reducing available nesting and migration habitat outside of refuge ownership.

Grassland habitat is considered a moderate to low priority at the BCR and physiographic area scale but is a declining habitat type in West Virginia (PIF 2003, WVDNR 2006). The physiographic plan specifically mentions the importance of maintaining early successional habitats within the larger forested landscape and notes that maintaining land currently in grassland habitat will contribute to conservation objectives for these species throughout the Northeast (PIF 2003).

The refuge does have the potential acreage to help sustain local populations of some declining obligate grassland species. Many grassland birds breeding on the refuge (grasshopper sparrow, savannah sparrow, eastern meadowlark) require at least 20 acres of contiguous grassland habitat (Jones and Vickery 1997). Breeding

grassland birds were found to respond more to vegetative structure and vertical diversity than to field size on the refuge indicating that existing grassland acreage supports functional obligate grassland breeding bird populations (Warren 2001). Continued maintenance of intact functional grasslands on the refuge adds to local and regional grassland bird species conservation and provides areas where nesting is not disrupted by mowing, haying, or grazing activities.

The use of refuge grasslands by species like grasshopper sparrow, savannah sparrow, Henslow's sparrow, bobolink, and Eastern meadowlark adds to the avian diversity of the refuge. Additionally, five grassland birds listed as priority 1 and 2 species by the WVDNR use refuge grasslands as breeding or migration habitat thereby contributing to the State conservation of these species (WVDNR 2006). Research conducted by the Service at 13 national wildlife refuges in region 5 from 2001 to 2003 found Canaan Valley's breeding obligate grassland bird population to be one of the more diverse in the study. Additionally density of breeding grassland birds at Canaan ranked 5th out of the 13 refuges in the study (Runge et al. 2004).

The highest density of obligate grassland breeding birds averaged over three years of a regional grassland bird study (2001-2003) and three years of a productivity study (2002-2004) was 0.27 per acre (0.7 /hectare) for the two refuge grassland study sites. Savannah sparrows had the highest density of the four grassland obligate species found. Grasshopper sparrows have shown a positive trend following a prescribed burn on the Beall Tract and recent banding operations have documented site fidelity to this field for this species (USFS data unpublished). Applying these density estimates across all refuge fields managed for breeding obligate grassland birds, we can determine if management actions are meeting targeted occupancy and density measures. We can use the data to refine objectives in the future and determine if the desired field characteristics are correct for achieving the fundamental objective.

An additional measure to ensure the refuge is meeting this objective is to repeat productivity monitoring of grassland nesting species to ensure nest success meets or exceeds previous documented figures. Overall nest success of grassland species on the refuge was 63.7 percent during a 2002-2004 study. Periodic nest monitoring can help determine the effectiveness of refuge management actions. This will be particularly important as increasing amounts of suitable grassland nesting habitat adjacent to the refuge are either developed or fall out of active grassland management (hay production and grazing). Since the grassland bird productivity research was conducted, over 133 acres of private grassland habitat have been developed in Canaan Valley. These areas may affect productivity on refuge grasslands by increasing competition for nesting and foraging habitat, decreasing the amount of post-fledging dispersal habitat available and possibly increasing predation through alteration of habitat (home development increasing predator base and predator movement corridors).

By reviewing the nest success, relative abundance, contribution to local biological diversity, and peripheral benefits to other species of grassland birds, the refuge determines that continued grassland management is an important contribution to the refuge's biological resources. If future research determines that factors such as nest success or abundance are below levels which warrant continued active management for grassland obligate nesting species, the management regime may change to provide benefits to migrating landbirds, raptors, and small mammal using these fields.

The use of managed grasslands by migrating birds has not been well documented at the refuge. It is suspected that rank grassland habitat is important for a variety of land birds moving through the area, especially for sparrow species. However, open grasslands are also important foraging areas for raptors such as northern harrier (State conservation priority), and rough-legged hawk. Northern

harriers concentrate in Canaan Valley in the fall and spring, and have also been documented in June; however only one nesting record exists for this species in Canaan Valley from 1964. Rough-legged hawks winter in the Valley and forage in refuge grasslands. Another objective will be to provide forage and cover (August–February) for migrating land bird and raptor species including northern harrier, and rough legged hawk. Other priority species benefiting from grassland management include Henslow's sparrow, pink-edged sulfur, Harris'checkerspot, and Atlantis fritillary.

Strategies

Within 0-3 years of CCP approval:

- Develop and implement a management plan to improve grassland habitat for nesting and migratory bird species.

Within 3-5 years of CCP approval:

- Remove trees and fences which cause fragmentation and edge effects and consolidate adjacent fields separated by these edge-forming features into larger units to increase the percentage of effective interior habitat.
- Assess the use and evaluate the importance of managed grasslands to migrating landbirds and raptors.



Kent Mason

Bobolink pair

- Work with partners to establish early successional management demonstration sites which include grassland habitat.

Within 10-15 years of CCP approval:

- Work with private landowners and partners to encourage late haying and mowing of grasslands adjacent to refuge property.
- Work with private landowners to develop conservation easements and other land protection incentives to maintain grassland habitat in the surrounding area.

Throughout the Life of the CCP:

- Set back succession by a combination of mowing, haying, or burning on a three-year cycle or as needed to reduce woody encroachment on 315 acres (Beall north, Beall south, Cooper, Harper, Freeland, and Orders tracts) of grassland focused on breeding areas for grassland obligate bird species. Some fields require shorter rotations where soil moisture and proximity to colonizing tree and shrub species promotes competition with desired grasses and forbs. Maintaining rotations will ensure that standing vegetation is retained in some fields for migration habitat.
- Continue appropriate monitoring and survey programs as funding and staffing permits. The results of these surveys will trigger adjustments to strategies for management, or evaluation of objectives needing refinement. Examples of monitoring or surveys:

- Evaluate achievement of the fundamental objective (measure abundance, relative abundance, and density on selected fields annually throughout the life of the CCP) by conducting point counts established in grasslands for surveys during the breeding season (late May through June).
- Evaluate quality of grasslands for grasshopper sparrows by conducting periodic vegetation surveys (height, grass-forb ratio, and percent bare ground) during the breeding season at bird survey locations. If sparrow density or percent occupancy falls, and grass height, grass-forb ratio and percent bare ground are contributing factors, then the grassland management regime will be reevaluated.

GOAL 4

Visitors of all abilities enjoy opportunities for wildlife-dependent recreation and education to enhance public appreciation, understanding, and enjoyment of refuge habitats, wildlife, and cultural history.

Objective 4.1 (Hunting)

Within 5 years of CCP approval, at least 80 percent of hunters on the refuge will report having a high-quality experience.

Rationale

Hunting is one of the six priority public uses to receive enhanced consideration on national wildlife refuges according to the 1997 Refuge Improvement Act. Hunting is recognized in the Refuge System as a healthy, traditional outdoor past time, and is deeply rooted in our American heritage.

In many cases, hunting does not just offer a form of wildlife-dependent recreation. It also provides a means to keep animal populations in balance with the carrying capacity of the land. White-tailed deer hunting, for example, is not only a wildlife-dependent form of recreation but also a means to curb local deer population growth in the valley and better manage and meet habitat objectives for biodiversity. Reducing the deer herd on the refuge will enable success in managing early successional habitats for woodcock and other species. Deer hunting also provides assistance with statewide deer population control efforts. Also, local communities have relied on hunting to limit crop and landscape damage from deer, and to provide outdoor recreation.

In the strategies below we present several methods for increasing the deer harvest, such as providing access to deer in remote portions of the refuge. Opportunities for access may increase as we acquire more land within the refuge's approved acquisition boundary. We will expand hunting pressure on a broader, landscape level. A concerted effort is necessary to exert uniform pressure on the herd on and off refuge lands. At the same time we need to prevent deer from simply moving to adjacent lands which do not permit hunting. In the past, the WVDNR has worked with homeowners in Timberline to develop a special hunt on their land. However those efforts never came to fruition. Canaan Valley Resort State Park may have a management deer hunt in the future. We will also develop educational programs for visitors and hunters to explain what the carrying capacity for deer should be and why recreational hunting is needed to accomplish these goals.

While we plan to use feedback from hunters to help determine whether our strategies are contributing to a more high quality hunt, it will be important to remember that not all hunters have the same criteria for measuring the quality of a hunt. Some deer hunters equate a quality hunting experience with seeing a high number of deer, while other deer hunters may want more of a challenge. Furthermore, it is possible that woodcock hunters could be more satisfied with hunting on the refuge than deer hunters due to our proposal to create more early

successional habitat, as described in the above objectives. On the other hand, offering more areas for woodcock hunting may translate into more hunters, and this may not be a desirable outcome for some hunters.

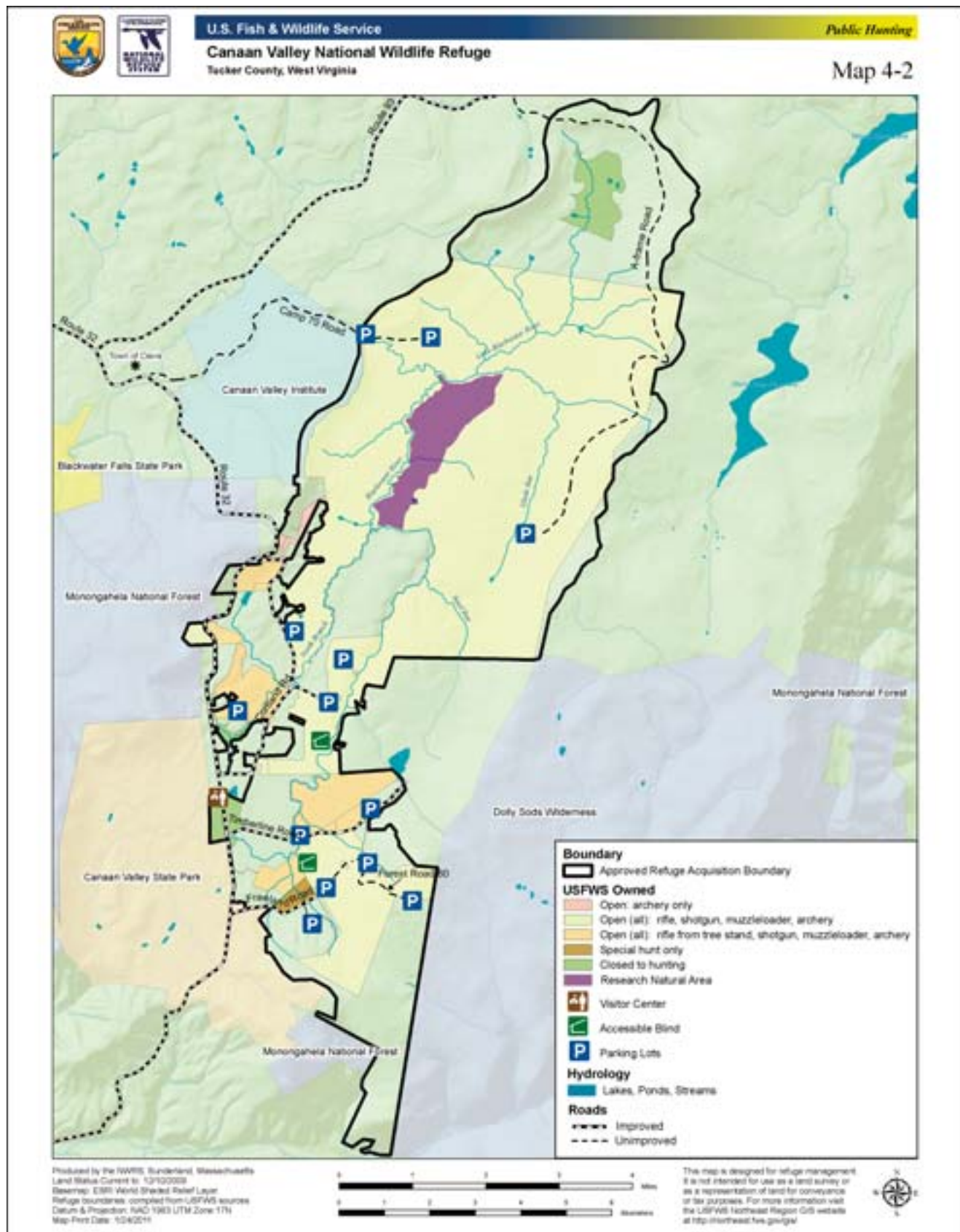
Strategies

Within 0-5 years of CCP approval:

- Implement a simpler, streamlined permitting system for the hunting program. This system will require less administrative time, but will still provide staff with information about the hunt. It will utilize Office of Management and Budget (OMB) approved hunt surveys, and may be run with the State licensing system.
- Modify “no rifle hunting zones” on the refuge hunt map to open additional refuge lands to rifle hunting (see map 4-2).
- Provide a shuttle service to facilitate deer removal during the first week of gun season. Shuttles will carry deer in and out of areas along Middle Valley Trail and Camp 70 Loop trail. A stream crossing along Middle Valley Trail (either Sand Run or Glade Run) will be made stable for ATV traffic. Staff and volunteer hunters will establish and coordinate the shuttle service, plan the routes, schedule pick up times, and publicize the service throughout the hunting community. Success of this program will be evaluated based on anticipated increased hunter pressure and harvest from the center of the refuge. Modification or cessation of the program are options should it fail to meet the refuge’s deer management goals.
- Open the Beall gate to allow hunters access to North Beall Road by licensed vehicle (only cars and trucks, no ATVs). Vehicles will follow the gravel road to the north, traveling an additional 0.8 mile towards the interior of the Main Tract, which is the 9,176-acre tract of land in the northern part of the refuge. Continued maintenance on the gravel road will be required.
- Close the Research Natural Area to all hunting according to Service policy, except for a deer management hunt.
- Request hunter participation in cottontail rabbit identification through collection of refuge harvested cottontail skulls. Work with the WVDNR for identification of eastern and Appalachian cottontails harvested on refuge lands.
- Provide outreach and education to promote understanding of the impacts of overabundant deer. This could include a section in the hunt brochure, a fall Visitor Center exhibit and a traveling exhibit.
- Gather deer population data and work with WVDNR, surrounding landowners, hunt clubs and other partners to reduce the deer herd in Canaan Valley by encouraging cooperative, managed deer hunts.
- Work with WVDNR to improve reporting on hunter harvest on refuge lands.

Within 5-10 years of CCP approval:

- Work with the State to permit special antlerless hunts on the refuge.
- Work with the State legislature and State representatives more closely on deer related issues, solutions, and legislative proposals.
- Require a special use permit for rabbit hunting.



Throughout the Life of the CCP:

- Provide quality, safe, compatible hunting opportunities according to State regulations and seasons through a refuge permit system.
- Continue to operate under the 2007 Amended Refuge Hunt Plan (USFWS, 2007c).
- Allow night hunting for raccoon.
- Offer a refuge hunt program that follows State of West Virginia seasons and regulations. The exception is that we do not allow hunting from the end of February through the beginning of September, except for spring gobbler season. Hunters are required to obtain a refuge permit prior to hunting on the refuge.
- Allow the use of hunting dogs per State regulations and in season for bear, raccoon, grouse, woodcock, and waterfowl. Up to six dogs per hunting party are allowed for bear hunting and up to four dogs for raccoon. Hunt dogs are allowed off-leash.
- Maintain two accessible hunt blinds. Maintain a reservation system for the blinds where the maximum stay is one week. If the demand for accessible hunt blinds exceeds those we provide, we will implement a lottery system and reduce reservation time.
- Limit the number of hunt permits if data shows a need to do so to preserve the quality of the hunt.
- Work with adjacent land managers and the WVDNR to encourage cooperative, managed deer hunts.
- Provide parking in designated areas for hunters.

Objective 4.2 (Fishing)

Within 5 years of CCP approval, provide fishing opportunities such that 80 percent of anglers report having a high-quality fishing experience on the refuge.

Rationale

In this management action we will officially open the refuge to fishing by amending 50 CFR 32.68. We will allow fishing according to State seasons and regulations. Fishing is one of the six priority public uses to receive enhanced consideration on national wildlife refuges according to the 1997 Refuge Improvement Act. Fishing is also an historical and traditional use in the Canaan Valley area, and it is a popular activity locally, State-wide and throughout the Refuge System. Fishing promotes an understanding and appreciation of natural resources and their management on all lands and waters in the Refuge System. Refuge-specific fishing regulations will ensure fish community health and demographic structure for sustainable populations.

The Refuge Improvement Act stipulates that “In administering the System, the Secretary shall...ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans...” One of several Service policies generated from that Act is contained in the Service Manual: 601 FW 3, “Biological Integrity, Diversity, and Environmental Health.” Part 3.14(f) of that policy states...”We do not introduce species on refuges outside of their historic range or introduce a species if we determine they were naturally extirpated, unless such introduction is essential for the survival of the species and prescribed in an endangered species

recovery plan, or is essential for the control of an invasive species and prescribed in an integrated pest management plan.” In the spirit of these stipulations, fisheries management on the refuge will focus on supporting self-sustaining habitats and native or naturalized species populations. Stocking native fish will be considered in cooperation with State partners and hatcheries in order to maintain a healthy and balanced ecosystem.

Strategies

Within 0-5 years of CCP approval:

- Officially open the refuge to fishing by submitting an opening package for fishing. As part of this process, we developed a compatibility determination in conjunction with the draft CCP/EA. That compatibility determination is included in the final CCP, as part of appendix B. The remaining components of the fishing package include a signed Finding of No Significant Impact for the final CCP, a published a final regulation, a revised 50 C.F.R. § 32.68, and a fishing plan.
- Assist partners in conducting creel and angler surveys.
- Work with the interagency fisheries group to develop a plan to maintain a quality fishery while restoring native fish populations within the refuge and the valley.
- Improve signage directing the public to designated approved fishing locations.
- Provide informational brochures and/or signs that promote awareness of refuge-specific and State fishing regulations.

Within 5-10 years of CCP approval;

- Educate anglers on the proper use and disposal of native and non-native bait, and on the benefits of wearing non-felt wading boots to reduce the risk of spreading unwanted aquatic invasives.

Throughout the Life of the CCP:

- Promote quality fishing opportunities according to State regulations.
- Allow fishing where approved public roads or public trails provide access to waterways or water bodies on the refuge.
- Maintain the Americans with Disabilities Act (ADA)-compliant fishing platform along Timberline Road and promote awareness of this new platform.
- Permit anglers to use parking areas provided near trailheads. Anglers may also park within a road’s right of way unless otherwise restricted by the refuge or Department of Highway (DOH). The refuge has no special parking areas specifically for anglers.
- Participate in the County’s annual fishing derby.
- Participate in the HOFNOD (Hooked On Fishing, Not On Drugs) Exposition.

Objective 4.3 (Wildlife Observation and Photography)

Within 5 years of CCP approval, at least 80 percent of refuge visitors engaged in wildlife observation and nature photography will report a high quality experience.

Rationale

Wildlife observation and photography are identified in the Refuge Improvement Act of 1997 as priority wildlife-dependent recreation activities. These

opportunities are provided daily on designated refuge roads and trails. This action will expand and enhance these opportunities in many different ways, as discussed below.

Increase trail connectivity and improve trail quality

Although the refuge provides 31 miles of roads and trails to visitors and an additional 10 miles of seasonal cross-country ski trails, many of these trails are isolated from each other. Visitors to Canaan Valley are looking for an outdoor adventure paired with wildlife observation and wildlife photography, similar to what they enjoy on neighboring public lands. Although our neighbors may have a different mission than the Service does, the refuge wanted to make an effort in this management action to connect some of the refuge's trails to provide visitors with the kind of wildlife-dependent recreation they are seeking. Connecting trails, both on and off refuge, allows people to travel longer distances for a more rigorous outdoor experience. Some people would also argue that becoming part of a long distance trail system offers a higher quality recreational experience. Longer, connected trails may also minimize the need for motorized vehicles and could contribute to improving air quality.



Installing a bridge over Glade Run

Trail connections in this management action provide increased access for travel by foot, bicycle, and horse. However these uses are still zoned, restricting bicycling and horseback riding to some but not all of the refuge's trails. This helps to avoid user conflicts and to maintain the biological integrity of certain habitat types on the refuge.

Also in this management action we will improve the quality of the existing refuge trail system. Many refuge trails were created on access roads, rail grades or skid roads for logging. They were not necessarily designed for long term use and stability. The refuge will look at these old routes and seek ways to improve them. For example, we might make trails more stable, easier to traverse, easier to maintain, or more interesting. We also developed a list of criteria for determining

whether current or future trails are compatible with refuge purposes. These criteria are used to evaluate re-routed trail segments and the development of new trails. Two criteria on the list include: (1) Route provides an opportunity to view a variety of habitats and wildlife and (2) the route has a low potential for fragmenting habitat or disturbing wildlife populations. For a full list of the criteria, see the compatibility determination for wildlife observation, photography, environmental education, and interpretation in appendix B. The goal of this effort is not to close trails, but to make them more sustainable. We will also take advantage of opportunities to couple habitat restoration work with managing or creating new public use trails.

Also in this management action we will name the new trail that will connect Swinging Bridge to Cortland Road after Chris Clower. Chris was a career Service employee who supervised the West Virginia Field Office in Elkins from 1980 until he died of brain cancer in 1996. Chris was a conservationist who was committed to protecting wetlands across the State of West Virginia. He was an avid sportsman who loved woodcock hunting and he spent many falls combing the valley in search of this elusive game bird. So great was his love for the valley that his ashes were scattered there after he died. Chris was an integral member of the Canaan Valley Task Force, a group of Federal agencies, local businesses, and conservation organizations who met regularly to discuss how to protect the wetlands of Canaan Valley. In the end, the group agreed that creating a national wildlife refuge would best accomplish that task. Chris, who was also a veteran of the Marines and was injured in Vietnam, was instrumental in garnering public support for the Canaan Valley refuge even before it was created. During the 1980's he worked with other Service employees to reach out to local community groups and organizations to explain the benefits of protecting wetlands and establishing a national wildlife refuge. Naming a public use facility after Chris will ensure that current and future visitors will not forget who he was and what he did for the valley's wetlands.

White Grass Ski Touring Center

White Grass Ski Touring Center (White Grass) operates about 10 miles of its commercial cross-country skiing and snowshoeing operation on the southern end of the refuge, which is also where Cheat Mountain salamander populations are located. Research related to the salamander has shown that logging roads and some heavily traveled hiking trails can serve as barriers to Cheat Mountain salamander movement and therefore can reduce genetic dispersal. Conditions related to blocking movements for salamanders appear to be related to increased temperature and humidity resulting from an open tree canopy as well as the removal of vegetation and leaf litter through public use activities creating bare soil conditions. The cross country ski trails that White Grass maintains are not used outside the ski season for public use and are not heavily traveled. Therefore excessive trampling resulting in the removal of litter and vegetation to create bare dirt surfaces does not occur on these trails. In addition, both Powderline and Three-Mile trails are narrow and have partial canopy cover providing shading and cooling effects to the trail surface.

The refuge will implement measures to improve habitat on these trails for the Cheat Mountain salamander. One method we plan is planting native trees on the edges of the trails to increase canopy cover. Increasing canopy cover will help improve leaf litter cover and decrease light penetration to the forest floor. The Powderline Trail and a section of Three-Mile Trail, cross known occupied Cheat Mountain salamander habitat. These trails are old logging roads and are groomed in the winter to a 4-ft. width. Maintenance during spring and fall includes the removal of fallen trees and branches, as regulated by a refuge special use permit. In 2009, the MNF initiated a study to design more effective road and trail

maintenance activities to benefit Cheat Mountain salamander populations (Pauley and Waldron 2008). We will consult closely with the USFS, Dr. Pauley and our Service Ecological Services Field Office to discuss the results and implications of this research to refuge trails. In the future, the refuge will also consider other options such as replacing trail segments with boardwalks to further facilitate salamander movement across trails. This action is one of the recommended management guidelines in the recovery plan for this species (USFWS 1991). Interpretive signs posted in the rehabilitated areas will highlight the habitat improvement work for the Cheat Mountain salamander.

Also in this final CCP, we will use a different and more updated process for permitting White Grass to operate some of its cross-country skiing and snowshoeing trails on refuge lands. Before the CCP, this use has occurred pursuant to an annual special use permit issued by the refuge to White Grass under specific conditions. Within five years of CCP approval, we will convert this special use permit to a concession contract, pursuant to Director's Order 139 and 50 C.F.R. 25.61. This Director's Order states that project leaders may use concession contracts to provide wildlife-dependent and other activities detailed in the National Wildlife Refuge System Improvement Act of 1997. This new process will require the refuge to prepare a prospectus and notify the public of available opportunities to operate a commercial concession on Federal land. Existing and previous concessionaires and any other interested parties will receive a copy of the public notice, making this a competitive process. We will conduct additional NEPA analysis if required.

Boating

Canoes and kayaks are popular means of accessing the Blackwater River and experiencing the refuge. Non-motorized boating provides visitors with different opportunities to participate in wildlife observation, photography and fishing. The primitive boat access sites at Timberline Road, Old Timberline Road, and at the Camp 70 Road pullout facilitate this use. In this management action we will further facilitate this use by improving current access sites.

Delta 13 Road/Camp 70 Loop

This road is currently an open, but unmaintained public road and is in major disrepair. It leads to a loop trail open to pedestrian travel, biking, and horseback riding. There is interest from the community and stakeholders to keep Delta 13 and the connecting loop open as a trail for pedestrians, biking, horseback riding, and vehicles.

The refuge will work with WV Department of Highway (WVDOH) to develop a plan for improving this roadway for access by pedestrians, biking, horseback riding, and vehicles. The road will be improved from the refuge boundary to the northern portion of the loop, where it will end with a parking lot and a hardened overlook. The remainder of this road, starting with the southern portion of the loop and heading east, will be abandoned and maintained as a trail for pedestrian, biking, and horseback riding only.

Once plans for the improved road and overlook are finalized, refuge staff will initiate the necessary environmental review and compliance process. Implementation of the plan can only begin when that process is complete, and when the refuge gains jurisdiction over the road.

In the interim, we will establish the width of the State's right of way on Delta 13/Camp 70 Loop. Our concern is that many vehicles drive well outside the State right of way and onto refuge land in order to avoid the deep, water-filled ruts in the main road, thus expanding the area that is affected by vehicle traffic. Once

we identify the boundaries for the right-of-way we can mark them so that vehicles will be prohibited from going outside the right-of-way and destroying additional wildlife habitat.

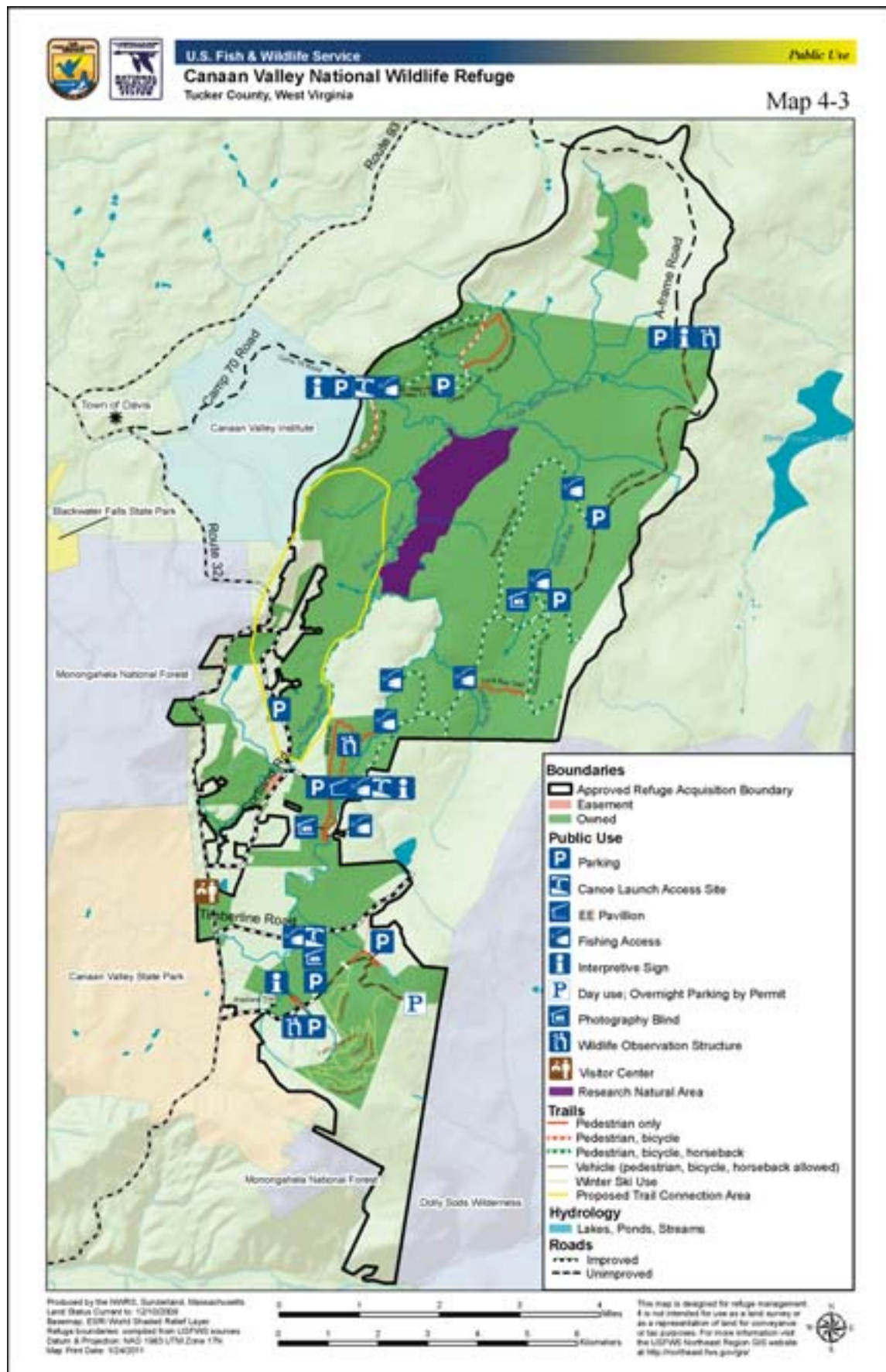
Freeland Tract

The Freeland tract will be closed to public hunting, fishing, and walking with dogs, to promote a quality wildlife observation/education experience without other competing public uses. However, due to the refuge's concern with deer impacts to plant communities, particularly the rare conifer wetland community on the Freeland Tract, we will permit special hunts. These hunts may include youth hunts and a special hunt for the physically disabled. We may also permit limited open hunts during the regular season should browse damage indicate that closure of this tract has exacerbated deer damage. Decisions on types of hunts permitted on the Freeland Tract will be made annually and may include opening up this tract to one week of public hunting while closing it down to other public uses.

Strategies

Within 0-5 years of CCP approval:

- Maintain the accessible boardwalk loop on Freeland Trail.
- Continue to allow visitors to walk with dogs on refuge trails, except on the Freeland tract trails, but leashes must be no longer than 8 feet. For hunting dogs see hunt regulations.
- Convert the special use permit for commercial cross-country skiing and snowshoeing on the refuge to a concession, pursuant to Director's Order 139 and 50 C.F.R. 25.61. Conduct additional NEPA analysis if required.
- Construct an interpretive kiosk, parking area, and viewing platform on A-frame Road at the beginning of the refuge boundary.
- Allow overnight parking by special use permit on Forest Road 80 for visitors accessing and camping in Dolly Sods. Camping on the road or anywhere on the refuge is prohibited.
- Revegetate edges of the Powderline Trail and part of Three-Mile Trail to improve habitat for Cheat Mountain salamanders.
- Increase monitoring to determine how Cheat Mountain salamanders are using the White Grass trails that transect known salamander habitat. Implement other conservation measures, such as raising sections of the trails or installing diverters under the trails, if future research finds these actions beneficial. Continue monitoring to determine whether the animals are using this infrastructure to move under the trails.
- Close the Freeland Tract to public hunting (except for special deer hunts), fishing, and walking with dogs, to provide additional, high-quality opportunities for wildlife viewing and study.
- Coordinate with CVI and other partners to connect the Swinging Bridge Trail to Cortland Road. Map 4-3 illustrates the general area where we believe this connection can be made, however this proposed trail will require further NEPA analysis and public review before a final route is selected.
- Pursue transfer of the Beall Bridge and the adjoining property to the Service.



- Connect the Beall Trails to the Middle Valley Trails and allow access for bicycle, horse, and pedestrians.
- Identify boat access points on refuge brochures and maps.
- Work with White Grass to improve trail signs to ensure visitors stay on designated ski trails while on the refuge.
- Consider rerouting or modifying steep trails to make them more stable and to minimize erosion.
- Identify and mark the boundaries for the State's right-of-way on Delta 13/Camp 70 Road so as to prevent vehicles from driving on refuge lands.
- Work with WVDOH to develop a plan for improving Delta 13/Camp 70 for access by pedestrians, biking, horseback riding, and vehicles. Improve the road from the refuge boundary to the northern portion of the loop, where it will end with a parking lot and a hardened overlook. Maintain the remainder of the road as a trail for pedestrian, biking, and horseback riding only. Implement the plan only after all environmental review and compliance processes are complete, and only after the refuge gains jurisdiction over the road.

Within 5-10 years of CCP approval:

- Construct a photo/observation blind along the trail at the end of A-Frame Rd.
- Initiate discussions with the State park about connecting the refuge Visitor Center to Canaan Valley Resort State Park via a trail.
- Work with Tucker County Trails on a connection between the Camp 70 loop trail and Brown Mountain Overlook Trail. When that connection is made, permit bicycle and pedestrian access on the western portion of the Brown Mountain Overlook Trail only.
- Install kiosk and directional signs to direct visitors toward boat access points.
- If monitoring efforts and new research conclude that salamanders are not crossing the commercial cross-country ski trails that transect their habitat, work with the concessionaire to discuss closing or relocating the trails.

Within 10-15 years of CCP approval:

- Improve two launch sites for canoes, kayaks, or other hand-launched boats at Old Timberline Road and the Camp 70 Road pullout.

Throughout the life of the CCP:

- Coordinate with adjacent land owners to form a "Heart of the Highlands" trail system, which will promote trail connectivity among public and private lands throughout the region.
- Continue to maintain refuge roads and trails year-round for public use.
- Continue to work with the refuge's volunteer-based Adopt-a-Trail program to maintain and improve trail conditions, signage and blazing.
- Continue to maintain three unimproved boat launches at Timberline Road, Beall Tract, and Camp 70.
- Continue to permit limited off trail use by non-hunters through issuance of Special Use Permits. Permits will be issued on a case by case basis to ensure compatibility with the purposes of the refuge.

Objective 4.4 (Expansion of Environmental Education and Interpretation)

Provide environmental education and interpretation opportunities that foster stewardship of the environment and reflect refuge priorities, including managing for migratory birds, endangered species, and wetlands.

Rationale

With additional staff requested under this management action, the refuge will have the ability and resources to expand its environmental education and interpretation programs. This will allow the refuge to reach more teachers and students every year.

The visitor center facilitates the six priority public uses by providing a place for hunters to obtain permits, maps, and other information; for anglers to obtain information on river access and fishing locations; and for photographers and wildlife observers to obtain information on refuge trails. The visitor center also offers interpretive exhibits, videos, maps, and other resources for orienting visitors to Canaan Valley refuge and for educating them about the local

ecosystem. Overall, the visitor center is a great asset to the refuge and community. Currently there is only one permanent staff member who is dedicated to operating the visitor center on a part-time basis. Although this staff member is supported by volunteers and seasonal staff, the refuge has struggled at times to keep the visitor center open just four days a week. In this management action we will focus staff and volunteer resources on keeping the visitor center open daily during peak seasons.

Supporting continued use of cross-country ski trails in partnership with White Grass permits expanded opportunities for environmental education and outreach during the winter months. Annually, 4,000-5,000

visitors ski on White Grass and refuge cross-country ski trails. As a condition of their special use permit, the staff at White Grass organizes winter trail walks for the public on a variety of refuge related and environmental topics. Typically, refuge staff members serve as the walk leader for one or two of these organized walks. Additionally the refuge has hired seasonal interns to develop and lead environmental education walks from the White Grass lodge. The use of the ski trails and White Grass operation contributes to the Service's mission for environmental education, interpretation, and wildlife observation and photography. Through this collaborative effort the refuge reaches hundreds of visitors each year during the winter, which is typically a time of low visitation.

The refuge will continue to encourage volunteers to take the lead with off-site programs. This enables the refuge staff to stay on the refuge and give priority to on-site programs.

Strategies

Within 0-5 years of CCP approval:

- Hire a new park ranger (GS 7/9) to support expanded programs and expanded Visitor Center hours.
- Double the number of students using the refuge annually.



USEFWS

Winter wildlife walk at White Grass Ski Touring Center

- Develop a self-guided interpretive trail on the Freeland Tract.
- Present at least three off-site exhibits and three off-site programs annually, provided they are largely run by volunteers.
- Continue the partnership with White Grass Ski Touring Center to organize and conduct interpretive walks during winter months.
- Develop a professional traveling exhibit.
- Offer 30-50 on-site interpretive programs annually.
- Open the visitor center seven days per week during times of peak visitation and at least three days per week during the rest of the year, but more if we can obtain volunteers and students to help staff the center.
- Design and construct or re-allocate space to designate a larger meeting room in the vicinity of the visitor center. The room should have the capacity to accommodate 100 seated people.

Within 5-10 years of CCP approval:

- With additional staff, develop and present at least three environmental education teacher workshops annually, in line with State education standards.
- With additional staff, advertise and present 12 or more field trips for school children on the refuge per year. Develop programs for various primary and middle school age children (grade K-1, 2-3, 4-5, and 6-8) that teachers may request.
- Plan and construct an environmental education pavilion (with electricity if possible) and an attached storage room for equipment at the Beall Trail, near the Blackwater River. This will provide a sheltered area for groups that are studying outdoors. The design should include restrooms, either portable or permanent.
- Determine the need for a floating platform on the Blackwater River for student river studies and, if needed, design and construct platform.
- Expand the refuge's reach to communities that are within an hour's drive of the refuge, such as Elkins, Oakland, and/or Petersburg, by presenting six to eight programs in these school districts per year.
- Develop additional interpretive signage for other trails and kiosks.
- Develop one reception area for the combined needs of the office and visitor center. Responsibility for staffing the reception area will be shared by full and part time visitor services staff and by administrative staff whenever volunteers are not available.

Throughout the life of the CCP:

- Provide an annual "Wild School Day" refuge experience for local students.
- Work with Tucker County Connections on environmental education and other programs.
- Work with local Girl Scouts on their summer day camp off-refuge, as requested.

- Assist teachers and youth group leaders with refuge field trips upon request whenever staff is available.
- Provide a small curriculum library where teachers may find lessons to teach about the environment.
- Support the local area Master Naturalist training program, providing space indoors and outdoors and providing instructors.
- Work with colleges and other partners on service learning and forest restoration projects.
- Maintain interpretive signs at trail heads and along trails.
- Provide a variety of on-refuge indoor and outdoor public programs related to nature and the refuge.
- Work with the cross-country skiing concessionaire on winter interpretive programs and educational materials.
- Recruit work camper volunteers and local and part-time resident volunteers to help staff the visitor center.
- Provide visitor center exhibits that illustrate the variety of habitats on the refuge and in the local area in general, and that promote the mission of the Service and of the Refuge System.
- Continue to employ a STEP (Student Temporary Employment Program) student to help staff the visitor center on Saturdays.

GOAL 5

Collaborate with partners to promote the natural resources of Canaan Valley and the mission of the National Wildlife Refuge System.

Objective 5.1 (Outreach)

Increase participation in events with local partners to advocate resource conservation and stewardship and to promote the mission of the Refuge System

Rationale

Public outreach will improve recognition of the refuge, the Refuge System, and the Service among neighbors, local leaders, conservation organizations, and elected officials, thus generating support for conservation in the region. An annual public open house will allow the refuge to present to the public the refuge's accomplishments and the public will have a chance to ask questions and make comments. This will also allow for regular, continual dialogue between the public and the refuge.

Strategies

- Participate in public lands working group.
- Participate in community outreach events such as HOFNOD and Forest Festival.
- Build working partnerships with NGOs and municipalities and through the Private Lands program at the West Virginia FWS Field Office.
- Continue to take interactive traveling exhibits to local festivals as time and staff permit.

**Objective 5.2
(Communication)**

- Hold an annual public open house, preferably in the fall.

Increase public awareness and attract visitors to Canaan Valley and the refuge through various forms of media, including local television, the Internet, newspapers, and promotional advertising.

Rationale

Good public relations depend on many factors. Important among these is open and continuing communication between the refuge and the public. Various means are available to refuge managers by which to communicate information effectively, such as contact with the public through refuge programs, news media interviews, news releases, and direct mailing. We will continue to facilitate communication with the community and stakeholders.

Strategies

- Continue to write news articles for the Parsons Advocate and Elkins Intermountain.
- Continue to write articles for the Timberdoodle (Friends of the 500th's newsletter).
- Continue to maintain web page.
- Investigate and utilize social media as appropriate and consistent with Service policy.